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WITH

International Abstract of Surgery

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Fig. 5. Drawing in illustration of the technical steps of radical resection of the primary lymph zone. *a*, Shows two types of incision. The one following the outer edge of the rectus for some distance and then curving out along the lower side of the twelfth rib gives a better exposure. *b*, Shows the initial inguinal incision exposing the cord which is clamped before delivering the tumor mass from the scrotum. *c*, Cautery division of the cord after gross inspection has confirmed the diagnosis. *d*, Shows the method of stripping back of the peritoneum beginning in the iliac fossa. The ureter and spermatic vessels strip up with the peritoneum. The vas deferens is seen crossing the ureter and is divided low down behind the bladder.

The Radical Operation for Teratoma Testis.—Frank Hinman, Thomas E. Gibson, and Adolph A. Kutzmann.

SURGERY, GYNECOLOGY AND OBSTETRICS

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THE RADICAL OPERATION FOR TERATOMA TESTIS

AN ANALYSIS OF SEVENTY-NINE CASES, TEN OF WHICH ARE PERSONAL[1]

BY FRANK HINMAN, M.D., THOMAS E. GIBSON, M.D., AND ADOLPH A. KUTZMANN, M.D., SAN FRANCISCO

TUMORS of the testicle present two considerations not found to a like degree in tumors elsewhere. The first relates to their pathology, which is so very complex and diverse as to have aroused considerable difference of opinion as to its nature, some considering all tumors teratomatous, in origin at least, while others recognize various homologous and heterologous types. The subject is very much confused by the inclination of so many to call a testicular tumor "sarcoma," when probably a true sarcoma of the testicle is a very rare type of tumor.

Secondly, embryological and anatomical peculiarities render the surgical treatment of the condition in one way very easy, in another way very difficult. Orchidectomy is so simple and practically without risk that it appears the obvious procedure, but the fact that metastases occur primarily to the remote retroperitoneal lymphatic neighborhood of embryological origin, alongside and upon the vena cava and aorta, permits simple removal of the testicle and its tumor to cure relatively few sufferers.

In previous publications (Hinman) the combined experience of various surgeons has been analyzed and has demonstrated in suitable cases the feasibility and technical ease of the radical operation. We believe at the present time that sufficient time has elapsed and a large enough series of radical operations has accumulated, to permit of more detailed analysis and to establish the radical operation as a sound surgical procedure, on the basis of cases with lumbar metastases that have remained cured 4 years or longer following the radical operation.

Our purpose in this contribution is, therefore, to present a comprehensive analysis of all cases thus far reported, comprising a total of 83 radical operations for testicular tumors (79 for teratoma testis and 4 performed by mistake on tumors which later proved to be tuberculous or luetic in nature) including 10 personal cases, 5 of which have been previously reported (Hinman).

HISTORICAL NOTE

Operations for malignant disease in general have been progressively elaborated, until now it is a general axiom of surgery that radical *en bloc* removal of the growth with the lymphatics and lymph glands that drain the area is the only proper form of treatment. Surgeons in general have failed to apply this rule to tumors of the testicle, probably because the deep situation of the involved lymphatics and the important structures which lie near them have appeared to preclude the performance of a radical operative procedure. Consequently, they have, on the whole, been content to perform simple castration and to trust that the lymphatics are not already infiltrated. On what feeble grounds this hope is based is shown (Table II) by the

[1]From the Department of Urology, University of California Medical School, San Francisco, California.

TABLE I.—ANALYSIS OF SEVENTY-NINE CASES OF RADICAL OPERATION WITH RESPECT TO LUMBAR METASTASES

	Group I-A	Group I-B	Group II-A	Group II-B	Group III-A
	Lumbar glands palpable clinically before operation	Lumbar metastases so extensive as to be inoperable	Metastases not found in the lumbar glands that were removed	Metastatic glands found and completely removed	Incomplete data
Number of cases	9	13	25	26	6
Inoperable	8	13			
Radical removal	1	0	25	26	6
Surgical mortality	3	2	3	2	
Died of metastases	5	4	8	6	1
Lost after discharge	0	0	1	0	
Living with metastases	1	4	1		
Living and well		0	12 2 over 4 yrs.	17 4 over 4 yrs.	5
Incomplete data		3			
Accidentally killed				1	

Summary

Group I—
- Operative mortality ..... 22.7 per cent
- Morbidity to date ..... 75.0 per cent
- Probable morbidity ..... 100.0 per cent

Group II—
- Operative mortality ..... 9.2 per cent
- Morbidity to date ..... 37.2 per cent
- Living 4 years or longer ..... 6 cases
- Living over 2 years ..... 14 cases

Grand Summary

Operative deaths	10 (12.6%)
Died of metastases	24
Living with metastases	6
Living and well	34
Killed or lost	2
Incomplete data	3
Total	79

very few cases that escape subsequent recurrence in the glands. The rarity of local recurrence in the scrotum following simple castration only serves to emphasize the need of a more radical procedure.

Realization of the inefficacy of simple castration has resulted in the gradual development of a satisfactory surgical procedure in the hands of a few men who have given the subject careful thought. From a historical point of view, the evolution of the radical operation may be divided into three periods:

1. Attempts to remove clinically appreciable abdominal metastases;

2. Realization of the gravity of such procedure, its futility, and attempts to perfect the method;

3. Development of the present radical operation, made possible by exact knowledge of the lymphatic drainage of the testicle.

To the first period belong the futile transperitoneal attempts of Kocher (1882–3) followed by Bergmann and Staenger, Bland Sutton (1895), Morris, Witzel, Tuffier and Guibal, Rogovski, Staffeld, Chifolian, and others (cited by Chevassu, and Sébileau and Descomps).

In the second period we find Stinson (1897) advocating a high excision of the cord and inguinal glands. Villar extended the inguinal incision with the patient in Trendelenburg position and was able to strip up the peritoneum for a short distance and to remove the vas, the spermatic vessels, and the iliac lymphatics. Similar operations have been variously performed, but the results show no improvement over simple castration, for the reason that they do not remove the primary lymphatics of the testicle. Furthermore, experience has taught that surgical inter-

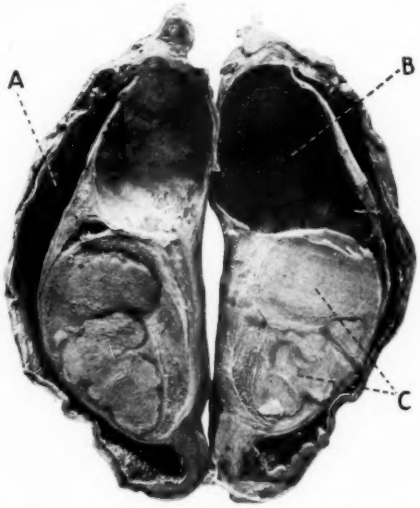

Fig. 1a. Photograph showing longitudinal section of large gumma of testicle, *C*, associated with a cyst of the epididymis, *B*, and hydrocele of the tunica vaginalis, *A*. The gross appearance is very similar to that of a seminoma and illustrates strikingly the difficulty of diagnosis on inspection at the time of operation and the value of microscopic confirmation by the frozen section method. Long diameter 13 centimeters.

Fig. 1b. Low power photomicrograph of margin of gumma of testicle (Fig. 1a), showing gummatous tissue, *A*, and typical perivascular lymphocytic infiltration, *B*, with interstitial fibrosis and absence of giant cells and endothelial cell reaction.

vention is contra-indicated in every case in which involvement of the lumbar glands can be determined clinically.

In the third period was developed the present radical operation as a result of an exact knowledge of the primary lymph glands into which the lymphatic channels of the testicle drain, which was first established by Most, in 1899. The primary lymph zones of the testicle lie in the neighborhood of embryological origin, as would be expected, namely, retroperitoneally, along the aorta and vena cava in the lumbar region. This system has been dwelt upon at length in previous publications (Hinman).

DIAGNOSIS

The clinical recognition of testicular tumor is largely a matter of exclusion. They present no pathognomonic signs or symptoms. They may vary markedly in size, sometimes being little larger than the normal testicle, at other times reaching huge proportions. Heydenreich reports a case in which the tumor extended to the level of the knees. Usually such enlargements are complicated by hydrocele, as in this case, in which the tunica vaginalis contained 10 liters of fluid. As a rule the tumor preserves the shape of a normal testicle and has a smooth, regular surface. Nodulation and irregularities, however, may occur, but are usually late. The consistency is ordinarily one of uniform hardness, although early smooth tumors may have considerable elasticity. Occasionally there may be found areas of fluctuation due to localized necrosis or cystic degeneration. The epididymis is ordinarily easily recognizable, but in advanced cases becomes completely obliterated. The cord may be somewhat enlarged but rarely either indurated or nodular. The skin of the scrotum is commonly uninvolved and found to be freely movable over the mass. It may appear red and shiny from being stretched, or present a congested appearance from increased vascularity, large bluish veins showing through. Exceptionally is it manifestly adherent to the mass or presents an area of gangrene or ulceration.

Syphilis, hæmatocele (hydrocele), and tuberculosis present problems of differentiation.

TABLE II.—RESULTS FOLLOWING SIMPLE ORCHIDECTOMY

Author	Number of cases	Number lost from observation	Time not stated	Number of cases dead				With metastases clinically	Number of cases living							4 yr. cures
				Within 1 yr.	In 1 to 4 yrs.	After 4 yrs.	Total		Time not stated	Less than 1 yr.	1 to 3 yrs.	3 to 4 yrs.	Total	Longer than 4 yrs.	Total	
Chevassu	100		15	38	27	1	81					4	4	15	19	19%
Chevassu	S 47 T 50		7	8 28	23 11	1	31 47					4		12 3	16 3	34% 6%
Kober	76		40	All died within 3 yrs.			1 (6yrs.)	41			18	6	2	26	8	34	13%
Nicholson	18			12				12		6 (1 to 5 yrs.)			6				
Howard	57	21	27							6 (all less than 3 yrs.)			2	8			
Hinman	24							20			1			3			
	S. 9 T. 9										1						
Coley	52 Orchidectomy and "Coley's serum"	14	18					9			3	3		3			
Barringer and Dean																	
Group II[1]	8	2	3					8		2	3	1	3				
Group III[2]	19	6	8					19		2			5				
Group IV[3]	6	2	2							2							

S—Seminoma. T—Teratoma. [1] No Surgery. "Primary inoperable." [2] Castration plus radium—"recurrent." [3] Castration plus radium—"prophylactic."

Gumma simulates tumor more often and closely than any other condition, and it is well never to forget that generalized lues and testicular malignancy may coexist. A positive Wassermann or antiluetic therapy should not be a cause for too long delay. It is preferable to remove gumma as has been frequently done than to delay in the removal of a malignant tumor (Fig. 1, *a* and *b*).

Some cases of hydrocele and hæmatocele present great difficulties in differentiation. The pathognomonic signs of transillumination and fluctuation may fail in hæmatocele, and certain teratomata in which cartilage and mucoid material preponderate may transmit light and be fluctuant. Trauma, as the important factor in hæmatocele, may have been absent, and its significance relative to tumor is about as great anyway. Hydrocele in conjunction may completely mask the presence of tumor, and on the other hand, simple hydrocele may present hard indurated areas due to organization and absorption. Of considerable help often is puncture drainage of the vaginalis, which enables more accurate palpation of the testicle. Significant of this is the frequency in the history of tumor cases of the occurrence of numerous tappings before the true condition was even suspected.

Tuberculosis more rarely presents difficulties and only in those rare instances of massive tuberculous epididymo-orchitis. The epididymis is the seat of primary election to tuberculosis and the disease produces characteristic nodulation as it progresses. Mistaken diagnoses are possible, however, as the senior author can testify, having both performed a radical operation for tuberculosis and delayed another in seminoma, thinking it was tuberculosis. Mistakes occurred in both cases after gross inspection following orchidectomy and in consultation with an expert pathologist. It was only after careful microscopic study later that an exact diagnosis was made. Figure 2, *a* and *b* demonstrates the unusual nature of massive tuberculosis of epididymis and testicle (Compare with Figures 1, gumma, 3, seminoma, and 4, teratoma.)

The recognition of malignancy in cryptorchism is difficult. Inguinal ectopy is more apt

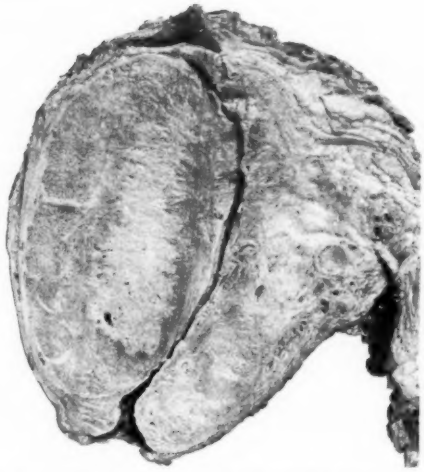

Fig. 2a. Photograph of solid testicular tumor due to massive tuberculosis. The uniform, smooth surface, absence of tubercles and of suppuration may lead to difficulty in diagnosis upon gross inspection and illustrate the need and importance of diagnosis by microscopic study of frozen sections in every case of doubt. Tumor measured 9 by 10 centimeters, the same size as the teratoma shown in Figure 4a.

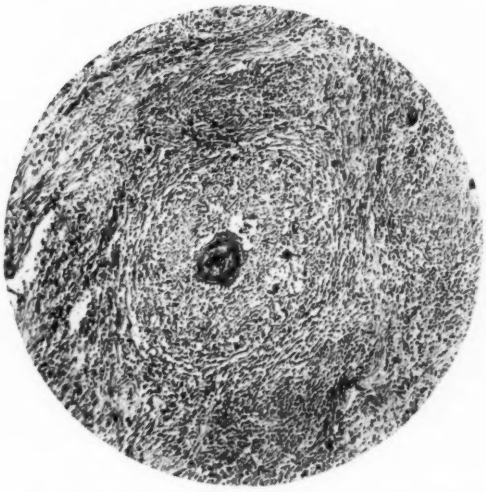

Fig. 2b. Low power microscopic view of typical tubercle, with central giant cell formation, peripheral endothelial and lymphocytic reaction and interstitial fibrosis, from gross specimen shown in Figure 2a.

to give early evidence because the anatomical position emphasizes pain and tumor. In abdominal retention, however, suspicion of the disease may be long delayed and only aroused by the appearance of an abdominal tumor, or by such secondary manifestations as neuralgia or œdema of the extremities from pressure on nerves or blood vessels. In these cases the congenital absence of a corresponding testicle in the scrotum is of great significance. The relative greater frequency of malignant change in cryptorchids has an important bearing upon the surgical correction of this deformity. Most surgeons recognize that spontaneous descent will not occur after puberty, and advise orchidopexy or orchidectomy at or before this period. Had the latter been done in all of Bulkley's 59 cases of tumor in intra-abdominal cryptorchids, 31 would have been saved.

In view of the difficulties in diagnosis, the extreme malignancy of these growths, and the simplicity of exploratory examination, the interest of the patient demands that every testicular enlargement which is in any way suspicious should be immediately inspected surgically and, when necessary, its exact nature determined by microscopic study. Delay in these cases proves fatal.

The period of primary lymphatic involvement is most variable. Extensive metastases have been found with tumors of recent onset, and *vice versa*. Autopsy and operative findings indicate that the mixed type of tumor (teratoma) spreads more rapidly than the unicellular type (seminoma) according to Chevassu. However, analysis of 79 radical operations with respect to types of tumor seems to promise an equally good prognosis for both types, and reveals furthermore the important fact that no inference as to the presence or extent of metastases can be had from a knowledge of the duration of the testicular enlargement (see Table III). Unfortunately, primary extension to the retroperitoneal lymph area gives no clinical evidence other than palpatory, and when these glands are large enough to be palpable, a late stage, probably with generalized metastases, is reached. Neither can the condition of the spermatic cord be taken as an index of extension, as microscopic studies have shown that the cord, and even the more proximal ilio-

TABLE III.—PROGNOSIS AS REGARDS DURATION AND TYPE OF TUMOR

	Seminoma			Teratoma		
	Duration	Died	Living	Duration	Died	Living
Group I-A	18 mos. 10 mos. Not stated	3 mos. 5 mos. 5 mos.				
Group I-B	8 mos. Not stated 9 mos. 6 mos. 6 mos.	31 mos. 4 mos. 13 days*	18 days 15 days	6 mos. 7 yrs.		Not stated 2 mos.
Group II-A	15 mos. 7 mos. 11 mos. 4 mos. 5 mos. 3 mos. 3 yrs. 16 mos. Not stated	5 yrs. 7 days* 7 mos. 2 mos.*	2 mos. 18 mos. 4 mos. 2 mos. 10 mos.	14 mos. 12 mos. Several yrs. Not stated Not stated Not stated 3-4 mos. 29 mos. 6 mos.	Not stated 9 mos.	28 mos. 28 mos. 12 mos. 22 mos. Lost track of 24 mos. 2 mos.
Group II-B	5 mos. 30 mos. 36 mos. 12 mos. Not stated Not stated 6 mos. 3 mos. 4 mos. 5 mos. Not stated**	8 mos.* 18 mos.	34 mos. 4 yrs. 10 mos. 8 mos. 10 mos. 8 yrs. 3½ mos. 30 mos. 8 yrs. 14 mos.	12 mos. 10 mos. 8 mos. 4 mos. 9 mos. 3 yrs. 1 mo. 7 yrs. 4 mos. 8 mos. 10 mos.	8 mos. 9 mos. 4½ mos. few hrs.*	3 yrs. 31 mos. 7 mos. 21 mos. 4½ yrs. 2 mos. 1 mo.
Group III-A	Not stated		24 mos.			
Total		12 cases	17 cases		6 cases	16 cases
Total	29 cases			22 cases		

SUMMARY

In 79 cases of radical operation for malignant tumor of the testicle, 29 are reported as seminomata, 22 as teratomata, and 28 are indefinite. Twelve cases of seminoma are dead and 16 living; 6 cases of teratoma are dead and 16 living. Omitting Group I, which was inoperable, and the 5 cases dying of causes other than tumor, supplies us with more exact comparative figures, thus, of 16 cases of seminoma, 3 are dead, and 13 living (3 living and well over 4 years, and 2 living and well approximately 2 years or more). So far as this limited series permits of analysis, the prognosis for seminoma and teratoma is about the same. The reader will recall that Chevassu in 100 cases of simple castration found that teratoma gave a decidedly less favorable prognosis than seminoma.

*Died of cause other than tumor. **Reported as carcinoma.

lumbar glands may be free from malignancy while the more distal glands may show well-developed metastases.

The prognosis from the standpoint of pathology is indicated in Table III. In explanation of the pathological terminology, it may be said that the pathogenesis of testicular tumors has long been a subject for dispute. Current views may be divided into two groups, one championed by Chevassu, maintaining that in addition to the mixed tumors of the testicle, there exists a large group of homologous unicellular tumors of malignant nature arising from the epithelium of the seminiferous tubules, the so-called "seminoma." The other group, led by Ewing, believes, probably correctly, that practically all testicular tumors are teratomatous in origin. The subject of pathology has been dwelt upon more fully in other publications, (Hinman and Kutzmann and Gibson). For clinical purposes, it is convenient to divide testicular tumors into two large groups, which occur with about equal frequency, seminoma (Fig. 3 *a*, *b*, *c*) and teratoma (Fig. 4 *a*, *b*, *c*) Chevassu found with simple castration that the prognosis was decidedly less favorable for teratoma. In the 79 cases of radical operation, the prognosis appears about equally good for either type.

PROGNOSIS

The extremely poor outlook for patients suffering with tumors of the testicle is well recognized. Orchidectomy even with early diagnosis is a dismal failure. There is sufficient statistical evidence to prove the inadequacy

Fig. 3a. Photograph of single cell type tumor, a seminoma. At the inner edge of the left half of the specimen is seen a small compressed remnant of the testicle. Usually no normal testicular tissue can be found. The tumor measured 5 by 7.5 centimeters.

of simple castration (see Table II). Obviously the procedure in order to cure must antedate extension outside the testicle, and this it has done in less than 15 per cent of the cases. A mortality after surgery of over 80 per cent is appalling, and that castration must be supplemented by radium, X-ray, or more radical surgery is apparent if any considerable improvement in treatment is to be gained.

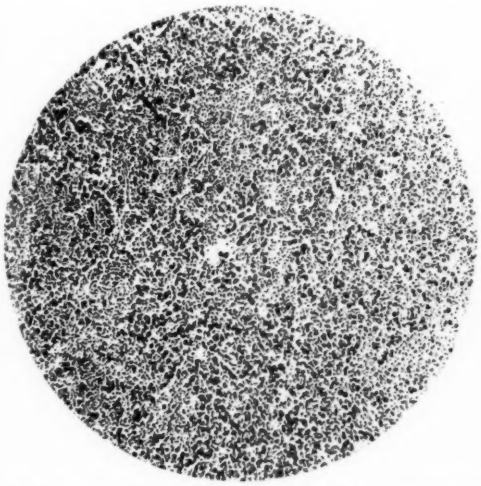

Fig. 3b. Photomicrograph (low power) of a seminoma, a uniform picture of large, round, vesicular cells resembling the spermatoblasts. This is the type of tumor which probably has been so frequently wrongly diagnosed as sarcoma.

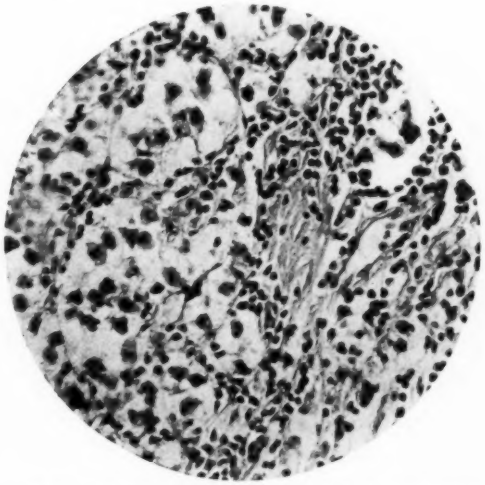

Fig. 3c. Photomicrograph (high power) of a seminoma. The uniform round vesicular cell distributed in a lymphoid stroma is characteristic. The nucleus is large and shows fine stippling as seen in spermatoblasts and generally one or two large nucleoli.

Fig. 4a. Photograph of a mixed cell type of tumor, a teratoma. No normal testicular tissue is seen. Multiple dissimilar areas characteristic of different types of tissue such as cartilage, gland, and single cell forms give a totally different picture from that of Figure 3a. The size of the tumor was 9 by 10 centimeters.

The results of Barringer and Dean in a 4 years' systematic use of radium are far from encouraging (see Table II). They report one remarkable case in which a large abdominal metastasis was palpable in the right pelvic region. Radium packs were placed over this mass before and after castration and within a month it had melted away so that it could no longer be felt. Examination of the testicular tumor proved it to be a teratoma (Ewing). The patient reports that he is entirely well now—3 years and 5 months after he was first seen.

In Béclère's case of seminoma treated by castration and followed 2 years later by a large tumor filling two-thirds of the abdomen, it does not seem likely that the mass was a recurrence but rather a splenic enlargement, since as a result of radium treatment the patient has been living and well for 5 years.

Taylor, in England, reports a striking instance of the result of radium in the case of a physician, aged 33, who was an inguinal cryptorchid (left). He had been operated upon for hernia at the age of 30 and the testicle was brought down into the scrotum. A year later he developed a malignant tumor of that testicle and simple castration was done. Eight or nine months later he developed a recurrence in the left iliac fossa, which was deemed inoperable. This mass was about the size of a cocoanut and compressed the vessels, causing œdema of leg and steadily increasing pain so that he was confined to bed and kept under the influence of morphine. On two occasions (6 to 7 weeks apart) radium was introduced by open operation into the mass, and on the first occasion a bismuth salt was introduced as well, so that the tumor might be subjected to the secondary rays given off by the bismuth as a result of its exposure to radium. The tumor decreased markedly in size, the patient recovered his health and was able to walk, dance, fish, and play golf. He was surgeon on the *Lusitania* for a time and remained perfectly well for 18 months. He developed glands in the neck, had hæmoptysis and a rapidly fatal issue supervened. The growth was carcinoma microscopically.

Cacciatore (Buenos Aires) reports a case of local recurrence shortly after castration treated with radium, with temporary relief. Three applications of radium were given. Abdominal metastases occurred and the patient died 6 months after operation. The diagnosis was "angio-myxosarcoma."

Levin states that the highly specific action of radium on the testicular cells undoubtedly explains the remarkable beneficial effect of radium on malignant tumors of the testicle. The rays destroy the spermatogenic elements without apparent injury to the other elements. French authors advocate radiotherapy upon this theoretical consideration. Accordingly the seminoma derived from the spermatoblasts is regarded as especially amenable to radiotherapy, while the mixed tumors may not be necessarily more susceptible than other tumors (Sébileau and Descomps). Barringer and Dean state that the more embryonal types of teratoma (regarding all cases as teratoma according to Ewing's classification) react most favorably. This statement is not at variance with the French view, since according to Ewing the seminoma falls in the class of teratoma of embryonic type (embryonal carcinoma).

The X-ray has also been used in the attack on these tumors. Orbaan's is the only system-

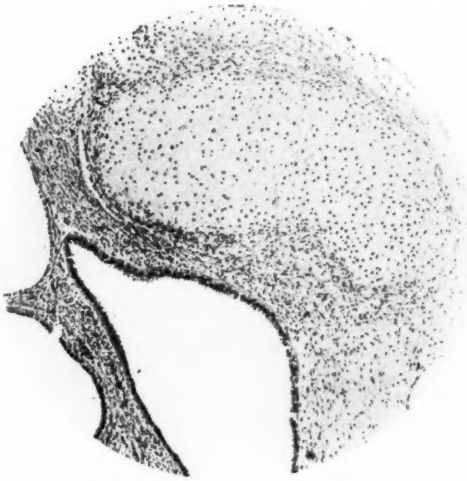

Fig. 4b. Photomicrograph (low power) of a teratoma showing area of cartilage and three cystic spaces, each lined with a different type of epithelium, cuboidal, short columnar, and high columnar.

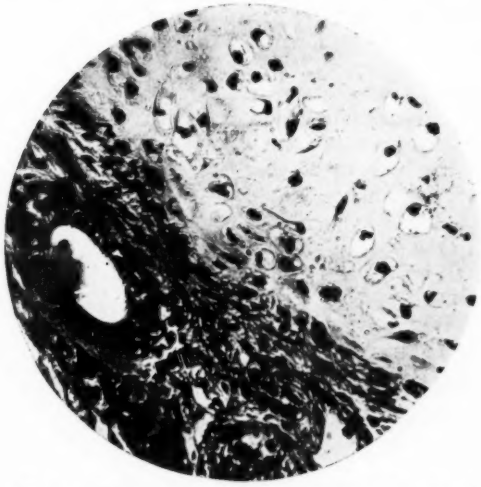

Fig. 4c. Photomicrograph (high power) at the edge of the area of cartilage in Figure 4b, but with a small epithelial lined cyst surrounded by connective tissue stroma invaded at portions of the outer rim of the cyst wall by malignant tumor cells.

atic study available. He reports nine cases treated before and after castration. Eight of these showed clinical evidence of recurrence when X-ray treatment was instituted. Six cases have died and three are living 24, 25, and 30 months, respectively, after starting X-ray treatments, and the patient living 25 months still shows clinical evidence of metastases. Metzmacher cites a temporary check in the progress of a recurrence after

TABLE IV.—SEVENTY-NINE CASES OF RADICAL OPERATION

Time elapsed since operation	Group I-A: Lumbar glands palpable clinically before operation		Group I-B: Lumbar metastases so extensive as to be inoperable		Group II-A: No metastases found in lumbar glands removed		Group II-B: Metastatic glands found and completely removed		Group III-A: Incomplete data		Total	
	Dead	Living	Dead	Living	Dead	Living	Dead	Living	Dead	Living	Dead	Living
0–6 mos.	6[2]	1*	5[2]	3*	4[2]	3	4[2]	4	....	....	19	11
7–12 mos.	1	....	....	....	3	2, 1*	4	3	1	....	9	6
13–18 mos.	1	....	....	1*	1	....	1	1	....	....	3	2
19–24 mos.	....	....	....	....	1	3	....	1	....	1	1	5
25–30 mos.	....	....	....	....	....	2	....	1	....	....	....	3
31–36 mos.	....	....	1	....	....	....	....	3	....	....	....	3
37–42 mos.	....	....	....	....	....	....	....	....	....	....	1	....
43–48 mos.	....	....	....	....	....	....	....	....	....	....	....	....
over 48 mos.	....	....	....	....	1	2	....	4	....	....	1	6
Not stated	....	....	(3)	....	1	(1)	....	....	....	4	1	4
Total	8	1	6 (3)	4	11	13(1)	9	17	1	5	35**	40

SUMMARY

Thirty-four cases dead, 40 living; 6 of 40 cases living have metastases, leaving 34 cases living and well. Four cases (indicated by parentheses) not stated (killed or lost). Ten cases (indicated by co-efficients above—[2], [3]) are included in the surgical mortality. Six cases (indicated by asterisks above) are living with metastases. It is to be noted that deaths after operation occurred almost always within the first year, and cases surviving this period in good health have a fair guarantee of cure. A point of prime importance in support of the radical operation as against simple castration is the fact that 4 cases having lumbar metastases have remained cured over 4 years since operation (2 of these are living and well 8 years after operation).

**This figure includes 1 case accidentally killed, and the 10 cases of surgical mortality, leaving 24 dead from metastases.

castration by the use of X-ray, although the patient died. One case in the writer's series of radical operations is of interest here. Large masses which were not palpable through a thick muscular abdominal wall were discovered upon retroperitoneal exposure. Several X-ray treatments have kept them stationary at least, as the patient, only recently examined, shows no palpable nodules and is active and in good health 19 months after castration and has gained 30 pounds in weight (Hinman, Case 8).

While the reports of radiotherapy are too few to prove or disprove its value, its use as a palliative measure and in conjunction with surgery as curative seems justified by the few apparently brilliant results recorded.

The poor results following simple castration for teratoma testis have stimulated surgeons to apply the well-recognized principle in the treatment of cancer elsewhere to this condition and attempt a radical removal of the primary lymph zone with the testicle. A period of 4 years or longer has passed after the performance of the operation in a sufficient number of cases to give an estimation of its merits (Table IV). Obviously those patients from whom lumbar lymph nodes with metastatic cancer were removed at operation, who have survived 4 years or longer, may be regarded as cured by reason of the radical treatment. Simple orchidectomy would have been of no avail in any one of these cases. In another group, however, careful microscopic study of the preaortic lymph area removed at operation failed to show any evidence of metastases, and it might appear that the radical operation was unnecessary were it not for the fact that four of these cases have since died with postoperative metastases to this same lymph area, a result which clearly indicates that the original operation, rather than being unnecessary because of the failure to find metastases, was insufficiently radical because failure completely to remove the whole lymph area is the only possible explanation of the subsequent appearance of metastases here. It is admittedly possible that a negative finding of glandular invasion of the lymph area removed in those who survive is an error either of microscopic recognition in the case of very early involvement, or of incomplete search, and that simple removal of the testicle would have failed to cure some of these. Nevertheless, a certain number of patients (15 per cent) will be cured by simple orchidectomy, as statistics show, and in these the radical operation is theoretically unnecessary. But the recognition of this small group is impossible clinically, and it is absolutely necessary to sacrifice them to radical treatment in the interest of the majority.

The results and findings in the 79 cases of attempted and successful radical resection are indicated in the accompanying tables (see Tables I, IV, and V). There were 22 inoperable cases, group I, in which the disease was so far advanced as to render them unsuitable for radical treatment. In 9, large lumbar masses were palpable clinically before operation, and in 13, metastastic nodes too extensive for surgical removal were found at operation. All but 5 have died, and these are doomed, the average period since operation that they have been followed being only 17 days. Six of the 22 died in the hospital as a result of the operation (shock 3, pneumonia 1, embolism 1, peritonitis 1). The morbidity of this group is 100 per cent.

In 51 cases, Group II, more or less successful removal of the lymphatic drainage system was accomplished. Five of these failed to survive operation—an operative mortality of 9.2 per cent. Fourteen cases have since died of metastases, and 11 of these are known to have died within 1 year. Twenty-nine cases are reported as living and well for 2 months to 10 years since radical operation, and it is worthy of emphasis that 6 of the 29 have outlived the four-year-time period for cure. Four of these six cures had metastatic invasion of the lymph tissue removed and all four are alive directly by virture of the clean, complete removal of this metastatic lymph area. Chevassu, 1, living and well 4 years and 10 months; Descomps, 1, living and well 8 years; Hinman, 1 (Eloesser), living and well 8 years; Hinman, 3, living and well 4 years, 7 months).

Consideration of these findings in comparison with what simple orchidectomy alone might have accomplished in this same series

Fig. 6. Drawing to show completion of the operation. The spermatic vessels at their point of junction with the abdominal vein and artery have been isolated, ligated, and divided before resection is attempted, which may then be carried out from above downward or from below upward.

TABLE V.—ANALYSIS OF CASES OF RADICAL OPERATION

GROUP I.—INOPERABLE CASES

A—Cases with Metastatic Lumbar Nodes Palpable Before Operation

Author	Date of operation	Age, years	Duration	Side	Clinical metastases	Operation and microscopical diagnosis	Died postoperative	Metastases	Living
1. Gregoire[2, 3, 4] Case 2	4-8-07	42	18 mos.	R	Abdominal masses palpable	Radical. Hard irregular mass on vena cava. Few glands removed for examination. Diagnosis: seminoma.	3 mos.		
2. Gregoire[2, 3, 4] Case 3	8-1-07	40	10 mos.		None at time of castration. Lumbar glands felt at time of radical	Castration 8-10-06 Radical 8-1-07. Hard diffuse mass upper limits of which could not be felt. Mass surrounded ureter. Operation confined to freeing this. Diagnosis: seminoma.	17 mos. after castration. 5 mos. after radical	Viscera and lumbar glands	
3. Fredet[2, 4]	4-24-09	27		L	Mass in left iliac fossa. Lumbar region negative cord infiltrated	Radical. Large adherent mass in left iliac fossa. Enlarged adherent glands about aorta. Left lumbar gland size of almond. Fragments removed for examination. Diagnosis: seminoma.	5 mos. †	Lumbar glands	
4. André	Not stated. Reported 5-8-12	40	8 mos.	L	Lumbar glands and mass near hilus of kidney size of walnut felt	Radical. 1 gland lower pole of kidney, 3 in angle formed by aorta and renal vessels removed. Suspicious induration higher up which could not be removed.			Lost from observation after discharge 2 weeks.
5. Pillet	Not stated. Reported 1913	37			Iliac and inguinalglands palpable	Radical with removal of all glands.	1 yr. †	Lumbar glands	
6. Georgesco and Savesco Case 2	Not stated. Reported 1914	24	1 yr.		Lumbar glands palpable	Radical exploratory incision with removal of testicle and cord. Abdominal mass inextirpable.	15 days‡ Pneumonia	Lung, spleen and lumbar glands	
7. Descomps Case 5	Not stated. Reported 1920	40		R	Metastases recognized 3 mo. after onset. Patient emaciated.	Radical exploratory incision with incomplete removal of large lumbar masses.	48 hrs. Shock	Lumbar glands	
8. Descomps Case 6	Ibid.	40		R	Metastases recognized at 4 mo. Patient emaciated	Radical exploratory incision with incomplete removal of large preaortic masses.	48 hrs. Shock	Lumbar glands	
9. Descomps Case 7	Ibid.	40		L	Metastases recognized at 6 mo. Patient emaciated	Radical exploratory incision. Inextirpable masses about aorta. Partial removal.	1 mo.	Lumbar glands	

†No autopsy. ‡Iliac juxta- and pre-aortic glands enlarged and confluent mass size of fist, between kidney and aorta. Nodules in spleen and lung. 1 cancerous subclavicular gland.

[1]Cited by Mascarenhas. [2]Cited by Delbet. [3]Cited by Chevassu. [4]Cited by Sébileau and Descomps.

of 79 cases is favorable to radical surgery. Orchidectomy could have been curative only when applied in the 25 cases of Group II-A, in which no invasion of the lymph area was demonstrable. Eight of these cases have since died of metastases, and they would not have survived after simple castration. Even granting that castration cured the remaining 13 cases, which is granting too much, it would cure only about 16 per cent of the 79 cases. The large group of 26 cases (Group II-B), which had early metastases to the primary lymph zone, would have received no benefit by orchidectomy alone, whereas the statistics show that at least 4 of these have been cured by the radical and clean removal of this area (living and well over 4 years), that 17 others are still living and well—8 for almost 3 years—and that it is, therefore, reasonable to expect a fair proportion of the 17 also to be

TABLE V.—ANALYSIS OF CASES OF RADICAL OPERATION—*Continued*

GROUP I.—INOPERABLE CASES—*Continued*

B.—Cases in Which Inoperable Lumbar Nodes Were Found after Retroperitoneal Exposure

Author	Date of operation	Age, years	Duration	Side	Clinical metastases	Operation and microscopical diagnosis	Died postoperative	Metastases	Living
1. Gregoire [1, 2, 3, 4] Case 1	4-20-05	33	8 mos.	R	None	Long inguinoscrotal incision extending to twelfth rib and then anteriorly along costal margin. Peritoneum stripped up to expose renal pedicle and abdominal vessels. Vena cava surrounded by mass of hard glands; 1 size of pigeon egg removed, others inoperable. Diagnosis: seminoma.	31 mos.	Lumbar glands	
2. Mauclaire [2] Case 3	Not given Reported 1907					Radical operation. Retroperitoneal metastatic glands inextirpable.			
3. Mauclaire [2] Case 4	Not given Reported 1907			L		Radical. Found inoperable retroperitoneal mass, so was content to explore region of renal pedicle.		Local and and lumbar metastases	
4. Barbier [1]	7-5-10	43		L	None	Radical. Large adherent gland mass about the aorta. Inoperable. Diagnosis: epithelioma.	3 mos.	Yes	
5. Duval [1] Case 1	4-12-10	29			None	Radical. One gland removed from large inoperable mass. Diagnosis: seminoma.	4 mos.		
6. Duval [1] Case 2	11-8-10	37	5 yrs.	R	None	Radical. Large mass of metastatic glands in region of cœliac axis inoperable. 2 glands removed for study. Diagnosis: epithelioma.	3 to 4 mos.	Viscera and lumbar glands	
7 Picot [1, 4]	4-25-12	35	9 mos.	R	None	Radical. Enlarged glands extending up to renal pedicle and behind left renal vein, removed. Weight 52 grams. Other inextirpable masses on left. Diagnosis: seminoma.			18 days postoperative Metastases present
8. Patel Case 1	Mar. 1913	18	6 mos.		None	Radical. Large inextirpable glandular metastases at bifurcation of vena cava. Diagnosis: teratoma.			
9. Georgesco and Savesco Case 3		36	6 mos.		None	Radical. Inoperable mass found on aorta. Diagnosis: seminoma.			15 days postoperative. Metastases present
10. Descomps Case 4	8-17-17	25	6 mos.	L	None	Radical. Inextirpable masses found on aorta. Diagnosis: seminoma.	13 days Embolism		
11. Roberts	10-16-01	38	14 mos.		None	Castration July, 1900. Operation for local recurrence July, 1901. Oct. 16, 1901—long median abdominal incision. Unsuccessful attempt to remove enlarged lumbar glands transperitoneally. Diagnosis: embryonal carcinoma.	6 wks. Peritonitis		
12. Hinman Case 8†	1-6-21	34	7 mos.	L	None	Castration Dec. 1, 1920. Radical Jan. 6, 1921—Removal of cord and spermatic vessels. Gland size of olive removed from bifurcation of aorta, and several large glands removed along aorta above bifurcation. Mass size of hen's egg at renal pedicle not removed. Given repeated X-ray treatments over abdomen post-operative. Diagnosis: seminoma.			Living and well 18 mos. postoperative gained 30 pounds. No metastases palpable
13. Young* Case 5	4-20-22	30	7 yrs.	R	None	Radical. Inoperable masses on aorta at level of renal pedicle. Diagnosis: teratoma.			2 mos. X-ray shows metastases to lung

†Previously reported. *Personal communication. [1]Cited by Mascarenhas. [2]Cited by Delbet [3]Cited by Chevassu. [4]Cited by Sébileau and Descomps.

SUMMARY OF A:

Operative deaths	3
Died of metastases	5
Living	1
Total	9

SUMMARY OF B:

Operative deaths	2
Died of metastases	4
Living with metastases	4
Incomplete data	3
Total	13

SUMMARY OF 22 CASES, GROUP I:

Operative mortality	22.7 per cent
Morbidity to date	75.0 per cent
Probable morbidity	100.0 per cent

TABLE V.—ANALYSIS OF CASES OF RADICAL OPERATION—*Continued*

GROUP II.—SUCCESSFUL RESECTION OF PRIMARY LYMPH AREA

A—No Invasion of Lymph Glands

Author	Date of operation	Age, years	Duration	Side	Clinical metastases	Operation and microscopical diagnosis	Died post-operative	Metastases	Living post-operative	Metastases present
1. Mauclaire[2] Case 1	1905				None	Radical—no glands found.			8 yrs.	Excised in scar 5 years and 8 years post-operative
2. Chevassu Case 2	11-6-09	31	15 mos.	L	None	Radical—no glands found. Diagnosis: seminoma.	5 yrs. †	Lung		
3. Chevassu[1] Case 3	10-31-11	28	7 mos.		None	Radical—removed 18 glands including 1 small one from iliac where it crosses ureter, 3 small pre-aortic, 1 small gland behind aorta on vertebral column, 1 gland beneath renal vessels and 3 glands in angle formed by aorta and iliac artery. Glands showed inflammatory reaction but no metastases.	7 days Peritonitis ‡			
4. Morestin[2, 4] Case 1	1910	50		L	None	Radical—no glands found (patient obese and alcoholic; anæsthetic poorly taken). Diagnosis: malignant tumor.	48 hrs. Pneumonia †			
5. Morestin[1, 4] Case 2	2-3-11	27	11 mos.	L	None	Radical—7 iliac glands removed. No lumbar glands found. 4-20-11 supraclavicular gland removed. Diagnosis: seminoma.	7 mos. §	Left kidney and lumbar glands		
6. Jacob[1, 4]	10-7-11	22	4 mos.	R	None	Radical—numerous glands removed from vena cava and 3 or 4 from iliac fossa. Diagnosis: seminoma.			2 mos.	None
7. Gregoire Case 5	1910	34	3 mos.	R	None	Radical—no glands found.			10 yrs.	None
8. Gregoire Case 6	5-10-15	46	5 mos.	L	None	Radical—removal of tumor and regional lymph glands. Diagnosis: seminoma.	18 mos. †	Probably lung		
9. Duval[1] Case 3	2-20-11		3 mos.		None	Castration 2-14-11. Radical 2-20-11. 3 glands removed—1 on aorta at renal pedicle, 1 pre-aortic, and 1 at bifurcation of aorta. Diagnosis: epithelioma.	9 mos.	Lumbar glands		
10. Duval[1] Case 4	12-12-11	44	8 mos.	R	None	Radical—no glands found.			18days	None
11. Delbet	2-18-10	43	14 mos.	R	None	Castration 2-14-10. Radical 2-18-10. 1 gland adherent to vena cava removed. No other glands found. Diagnosis: teratoma.			28mos.	None
12. Michon[2, 4] Case 1	1-29-10	25	12 mos.	L	None	Radical—2 small glands removed from aorta. Diagnosis: teratoma.			28mos.	None
13. Michel[4]	7-27-10	32	3 mos.		None	Radical—1 small gland in spermatic sheath removed. Diagnosis: seminoma.	2 mos. Pneumonia			
14. Pringle*	3-20-12	28	Sev. yrs.	L	None	Radical—lumbar iliac, and inguinal glands removed *en masse*. Diagnosis: teratoma.			2 yrs.	None

*Personal communication. [1]Cited by Mascarenhas. [2]Cited by Delbet. [3]Cited by Chevassu. [4]Cited by Sébileau and Descomps.
‡No metastases found. §Large lumbo-aortic masses with invasion of lower pole of left kidney. †No autopsy.

TABLE V.—ANALYSIS OF CASES OF RADICAL OPERATION—*Continued*

GROUP II.—SUCCESSFUL RESECTION OF PRIMARY LYMPH AREA—*Continued*

A—No Invasion of Lymph Glands—*Continued*

Author	Date of operation	Age, years	Duration	Side	Clinical metastases	Operation and microscopical diagnosis	Died post-operative	Metastases	Living post-operative	Metastases present
15. Lapointe and Alberstadt [4]	11–30–12	39	8 mos.	R	None	Castration 11–13–12. Radical 11–30–12. 2 small glands at iliac bifurcation; several glands where ureter crosses iliac, also on vena cava and aorta removed. Diagnosis: epithelioma.	6 mos. ‖	Liver, lung		
16. Georgesco and Savesco Case 1		35	3 yrs.		None	Radical—1 gland removed from iliac fossa and 1 from aorta to which it was adherent. Diagnosis: seminoma.			9 mos.	Symptoms of hydronephrosis
17. Barringer* Case 1	Reported in 1921				None	Radical—2 enlarged glands found high up in spermatic chain, showing chronic interstitial and hyperplastic inflammation. Radium emanations given. Diagnosis: teratoma.			22mos.	None
18. Barringer* Case 2	Reported in 1921				None	Radical—no suspicious glands found, so radium not used. Diagnosis: teratoma (chorioma).		Lung		
19. Barringer* Case 3					None	Radical—no suspicious glands found, so radium not used. Diagnosis: teratoma.			Lost track of	
20. Young* Case 1	11–24–14	36	18 mos.	R	None	Radical—glands not stated.	2 yrs.	Lumbar glands		
21. Young* Case 3	4–17–19	29	3 to 4 mos.	L	None	Radical—no metastatic glands. Diagnosis: teratoma.			2 yrs.	None
22. Hinman† Case 2	12–13–17	33	29 mos.	R	None	Radical—1 macroscopic gland at point where ureter crosses iliac. Diagnosis: teratoma.	9 mos.	Lungs and lumbar glands		
23. Hinman Case 9	6–30–22	30	6 mos.	R	None	Radical—removal of iliac and pre-aortic glands with spermatic sheath up to renal pedicle. Diagnosis: teratoma.			8 mos.	Clinical evidence of visceral metastasis
24. Hinman (Hepler) Case 10	June, 1922	26	16 mos.	R	None	Radical—3 large glands removed from iliac vessels, and 1 from between aorta and vena cava 2 centimeters below renal pedicle. Diagnosis: seminoma.			2 mos.	None
25. Lipschutz	12–31–20	45	Not stated. Sudden increase in size 6 days before	R	None	Radical—no glandular metastases found. Testis undescended inguinal. Given Coley's serum and radiotherapy postoperatively. Diagnosis: seminoma.			10mos.	None

*Personal communication. †Case previously reported.
[1]Cited by Mascarenhas. [2]Cited by Delbet.
[3]Cited by Chevassu. [4]Cited by Sébileau and Descomps.
‖Metastases both lungs and liver.

SUMMARY OF A

Operative deaths	3
Died of metastases	8
Living	13 (over 1 yrs., 2)
Lost after discharge	1
Total	25

cured, inasmuch as the great majority of those who die of metastases die within 1 year (11 of 14). Radical operation even now is seen to have improved the results of treatment of teratoma testis over orchidectomy 100 per cent, and in suitable cases we can expect a cure of 30 per cent or more instead of the appalling 15 per cent, as formerly.

TREATMENT

Present knowledge of the clinical course, diagnosis and prognosis of teratoma testis

TABLE V.—ANALYSIS OF CASES OF RADICAL OPERATION—*Continued*

GROUP II.—SUCCESSFUL RESECTION OF PRIMARY LYMPH AREA—*Continued*

B—Metastatic Extension to Lymph Glands

Author	Date of operation	Age, years	Duration	Side	Clinical metastases	Operation and microscopical diagnosis	Died Post-operative	Metastases	Living post-operative	Metastases present
1. Cuneo[1,3] Case 1	8–26–06	26	12 mos.	L	None	Castration 4–21–06. Radical 8–26–06. 1 lumbar gland showed metastases. Diagnosis: teratoma.			3 yrs.	None
2. Gregoire[4] Case 4	4–10–08	21	10 mos.	R	None	Radical—6 glands removed: 4 from vena cava, one at bifurcation of aorta, and 1 on iliac vein where ureter crosses. Latter, only, showed metastasis. Diagnosis: teratoma.	8 mos.	Lung;none clinically in lumbar glands		
3. Gosset[2,4]	2–6–09	32	5 mos.	L	None	Radical—removed 3 glands below hilus of kidney, 1 on ureter 5 cm. from renal pedicle, and 3 at bifurcation of exterior iliac. All lumbar glands showed metastases. Diagnosis: seminoma.			34mos.	None
4. Chevassu* Case 1	7–7–09	42	30 mos.	R	None	Radical—removed 3 glands on vena cava,2 between vena cava and aorta and 1 iliac gland. Showed metastases. Diagnosis: seminoma.			4 yrs. 10mos.	None
5. Bland Sutton	Sept. 1909	31	8 mos.	R	None	Radical—explored lumbar region removing glands which were palpable. Found 1 gland size of haricot bean on vena cava at level of third lumen vertebra which was malignant. Diagnosis: teratoma.			2 yrs. 7 mos.	None
6. Vautrin	Apr. 1910	42	8 mos.		None	Radical—1 gland size of hazel nut on internal iliac, 1 below renal pedicle, 1 on aorta.	1 mo.	Probably in spleen		
7. Michon Case 2	2–25–11	31	3 yrs.	R	None	Radical—removed gland 25 cm. in diameter from anterior surface of vena cava which showed malignancy. 1 iliac gland removed showing only an inflammatory reaction. Diagnosis: seminoma.			8 mos.	None
8. Gayet	10–28–10	49	10 yrs. before pain, increase in size. 45 days before sudden increase	R	None. Scrotum ulcerated	Radical—removed large gland from iliac where ureter crosses (malignant),andchain of glands from vena cava and aorta. Diagnosis: embryonal epithelioma.	25 days Pneumonia. Alcoholic nephritis. †	No lumbar gland metastases		
9. Howard*	1910	10	10 wks.	L	None	Radical—removed numerous glands along aorta.	1 yr.	General, and in lumbar glands		
10. Davis	4–5–11	17	4 mos.	R	None	Radical—*en bloc* removal of testis (undescended inguinal) and gland-bearing area. 1 gland 1 cm. in diameter removed separarately at level of renal pedicle on vena cava showed metastases. Other glands not examined. Diagnosis: teratoma.	9 mos.	General abdominal and lumbar		

†No glandular metastases.
*Personal communication.
[1]Cited by Mascarenhas.
[2]Cited by Delbet.
[3]Cited by Chevassu.
[4]Cited by Sébileau and Descomps.

TABLE V.—ANALYSIS OF CASES OF RADICAL OPERATION—*Continued*

GROUP II.—SUCCESSFUL RESECTION OF PRIMARY LYMPH AREA—*Continued*

B—Metastatic Extension to Lymph Glands—*Continued*

Author	Date of operation	Age, years	Duration	Side	Clinical metastases	Operation and microscopical diagnosis	Died post-operative	Metastases	Living post-operative	Metastases present
11. Maragliano[4]	7–4–11	36	1 yr.	R	None	Castration 6–27–11. Radical 7–4–11. Removed 2 glands in iliac fossa, one 4 cm. long, another mid-sacral 1 cm. long, another at aortic bifurcation 4½ cm. long, and 1 between aorta and vena cava 1½ cm. long. Latter showed metastasis. Diagnosis: seminoma.			10mos.	None
12. Descomps Case 1	8–18–11	24		L		Radical—24 glands removed. Gland metastases present. Diagnosis: seminoma.			8 yrs.	None
13. Descomps Case 2	6–16–14	37		L		Radical—removed 64 glands (3 large). Gland metastases present. Diagnosis: seminoma.	8 mos. Killed in accident	None		
14. Descomps Case 3	1–15–20	40	6 mos.	L	None	Radical. (Duration of operation 1 hour.) 22 glands removed (3 spermatic, 9 iliac, 10 lumbar), all malignant with exception of 1 large lumbar node about which there is doubt. X-ray postoperative. Diagnosis: seminoma.			3½ mos.	None
15. Lister	1914	41		R	None	Radical—lumbar glands did not appear enlarged, but were sarcomatous on microscopic examination (inguinal cryptorchid). Diagnosis: sarcoma.			3 wks.	None
16. Matas	1–15–15	28	9 mos.	L	None	Castration 12–10–14. Radical 1–15–15. Malignant glands removed. Diagnosis: teratoma	4½ mos.	Lung		
17. Mauclaire Case 5	1922	48	3 yrs.	R	Palpable glands in groin. Skin adherent to tumor. Œdema of thigh and scrotum.	Radical—including excision of inguino-crural glands and adherent scrotum. Glands removed from iliac vessels and vena cava. Diagnosis: teratoma (chorioma).			7 mos.	None. Œdema increased due to excision of lymphatics supposedly
18. Young* Case 2	1–2–15	34	3 mos.	R	None	Dec., 1914, castration and removal of inguinal glands. Testis and glands showed sarcoma. 1–2–15 radical operation. Several glands removed, malignant. Diagnosis: sarcoma, probably seminoma.			2 yrs. 6 mos.	None
19. Young* Case 4	10–19–20	24	1 mo.	R	None	Radical—metastastic glands removed. Diagnosis: teratoma.			21mos.	None
20. Hinman† (Eloesser) Case 1	11–20–14	30	4 mos.	R	None	Castration 10–27–14. Radical 11–20–14, performed because of recurrence in stump of cord. 1 small gland removed. Diagnosis: seminoma.			8 yrs.	None
21. Hinman† Case 3	1–29–18	30	7 yrs.	L	None	Radical—numerous small glands along iliac vessels and 1 large gland at renal pedicle removed in *en bloc* dissection. The latter was malignant. Diagnosis: teratoma.			4¼ yrs.	None

†Case previously reported.
*Personal communication.
[1]Cited by Mascarenhas.
[2]Cited by Delbet.
[3]Cited by Chevassu.
[4]Cited by Sébileau and Descomps.

TABLE V.—ANALYSIS OF CASES OF RADICAL OPERATION—*Continued*

GROUP II.—SUCCESSFUL RESECTION OF PRIMARY LYMPH AREA—*Continued*

B—Metastatic Extension to Lymph Glands—*Continued*

Author	Date of operation	Age, years	Duration	Side	Clinical metastases	Operation and microscopical diagnosis	Died post-operative	Metastases	Living post-operative	Metastases present
22. Hinman† Case 4	7-27-18	36	4 mos.	R	None	Radical—a large metastatic gland was found and removed which was very adherent to vena cava at level of lower pole of right kidney. Diagnosis: teratoma.			2 mos.	None
23. Hinman† Case 5	Aug. 1918	29	5 mos.	R	None	Radical—large gland removed from aorta and vena cava 5 cm. below renal pedicle. Diagnosis: seminoma.	18 mos.	Right kidney and lumbar glands		
24. Hinman Case 7	1-5-21	24	18 mos.	L	None	12-27-20—Testis and epididymis removed, and through perineal incision 1 vesicle and vas were removed. Diagnosis TB clinically. 1-5-21—Radical—for teratoma testis. A chain of enlarged glands was found running along iliac vessels and up to renal pedicle. Large malignant gland removed at level of renal pedicle. Diagnosis: teratoma.	Few hrs.	Acute cardiac dilatation		
25. Asteriades	1921	35			None	Radical operation—metastatic gland size of millet seed removed where ureter crosses iliac. Diagnosis: carcinoma.			14 mos.	None
26. Young* Case 6	10-16-22	33	10 mos.	L	None	Radical operation — unusually large lumbo-aortic glands removed just level of renal pedicle. Diagnosis: teratoma.			Not stated	None

†Case previously reported.
*Personal communication.
[1]Cited by Mascarenhas.
[2]Cited by Delbet.
[3]Cited by Chevassu.
[4]Cited by Sébileau and Descomps.

SUMMARY OF B

Operative deaths	2	
Died of metastases	6	
Living	17	(over 4 yrs., 4)
Accidentally killed	1	
	26	

SUMMARY OF 51 CASES, GROUP II

Operative mortality	9.2 per cent
Morbidity to date	37.2 per cent
Living 4 years or longer	6 cases
Living over 2 years	14 cases

emphasizes the following points of treatment: An early and accurate diagnosis of every testicular enlargement is essential, and in every case of reasonable doubt there should be no hesitation in exposing the tumor to surgical inspection, and whenever necessary performing castration and subjecting the tissue to immediate microscopic examination. Hæmatocele and massive tuberculosis require surgery, so that, by adopting such a policy, the only possible sacrifice is that of an occasional gumma of the testicle. Too many malignant growths have been neglected through uncertainty in diagnosis. Repeated tappings and prolonged observation are inexcusable in view of the simplicity of exploration.

Once the diagnosis is established, one of two lines of procedure is indicated: either a palliative course of treatment by orchidectomy with radium or X-ray therapy, or an attack, more commensurate with the extreme seriousness of the disease, by radical resection of the growth and its primary lymphatic area. A certain number of cases that come for treatment will have clinical evidence of abdominal metastases. Radical resection should never be attempted in these cases. They are inoperable. Radium packs and X-ray therapy as used by Barringer or Orbaan may check the progress of the malignancy and prolong life. In all other cases, metastases not demonstrable clinically, the attack should be

TABLE V.—ANALYSIS OF CASES OF RADICAL OPERATION—*Continued*

GROUP III.—INCOMPLETE DATA AND MISTAKEN DIAGNOSIS

A—Data Insufficient for Analysis

Author	Date of operation	Age, years	Duration	Side	Clinical metastases	Operation and microscopical diagnosis	Died post-operative	Metastases	Living post-operative	Metastases present
1. Guyot	Not stated. Reported 5-27-21					Radical operation followed by radiotherapy.			Yes	No
2. Patel Case 2		16	5 mos.		None	Radical removal of tumor and regional lymphatics. Diagnosis: sarcoma.				
3. Mauclaire[2] Case 2	1907					Radical operation. Patient very obese.	9 mos.	Both humeri		
4. Pauchet	1910	17	5 mos.		None	Radical operation with removal of glands which were not examined (lost).				
5. Marion Case 2	1920	Young				Radical removal of enlarged lymph glands (ilio-lum.).				
6. Masini	Not stated. Reported 4-4-21					Radical operation. Diagnosis: seminoma.			2 yrs.	No

B—Mistake in Diagnosis.

1. Cuneo[1] Case 2	9-9-07	40	1 yr.	R	None	Radical operation—only 1 gland found at operation between aorta and vena cava. Diagnosis: lues.			5 yrs.	
2. Marion[1] Case 1	1910	37			None	Radical operation—no glands were found, and no attempt was made at lymphatic area. Diagnosis: lues.				
3. Mercade[1]	3-14-11	30	5 mos.		None	Radical operation—no glands found. Diagnosis: lues.			Yes	
4. Hinman† Case 6	8-7-20	46	3 mos.	R	None	Radical — numerous enlarged iliolumbar glands removed. On microscopic examination tumor proved to be massive. Tbc. epididymo-orchitis. (Fig. 2 a and b). Glands showed endothelial hyperplasia. Diagnosis: tuberculosis.			2 yrs.	

†Case previously reported.
*Personal communication.
[1]Cited by Mascarenhas.
[2]Cited by Delbet.
[3]Cited by Chevassu.
[4]Cited by Sébileau and Descomps.

SUMMARY OF 79 CASES

Operative deaths	10 (12.6 per cent)
Died of metastases	24
Living with metastases	6
Living and well	34
Killed or lost	2
Incomplete data	3
Total	79[5]

[5]4 cases of mistaken diagnosis not included.

whole-hearted. A certain number of these, unfortunately, will show inoperable masses after retroperitoneal exposure, and will necessarily be condemned to the palliative methods of radium and X-ray. Radiation of the open wound at the operating table is commendable for these as well as for cases of successful resection. In a larger group, which will increase with earlier and more accurate diagnosis, radical surgery is indicated. A small number of these cases might be cured by simple castration, inasmuch as metastases have not yet occurred, but in the interest of the majority they should unhesitatingly be exposed to the risk of a radical operation. This surgical risk is not great, less than 10 per cent, and will undoubtedly diminish as greater knowledge and experience with the operation are obtained.

The technical steps of radical operation for teratoma testis are shown in Figures 5 (frontispiece) and 6. The patient is better turned a little to the opposite side, with a small pad under the back. The cord is exposed through an inguinal incision and clamped so that subsequent pressure and manipulation in delivering the testicle will not spread cells into the blood stream. If upon delivery of the scrotal mass a solid testicular tumor is found, castration should be completed by severing the cord below the clamp with cautery. The tumor mass is immediately sectioned by a pathologist or assistant in order to confirm the diagnosis. Too many radical resections of retroperitoneal glands for tuberculosis or syphilis have been performed (four are reported) to warrant the omission of this necessary diagnostic step. In case of malignancy, the inguinal incision is extended to the twelfth rib, which it then parallels (Fig. 5, *a*). Muscle and fascia are divided in the line of this skin incision down to the peritoneum. Beginning in the iliac fossa (Fig. 5-*d*), the peritoneum is stripped back to and beyond the large abdominal vessels. The ureter and spermatic vessels with lymphatics strip up with the peritoneum, but the lymph nodes remain upon, sometimes being quite adherent, to the vena cava and aorta. Theoretically, the lymph area should be removed from above downward, but practically its clean and complete removal is more difficult in this way than by resection from below, for the reason that traction on the cord greatly facilitates following it and making a clean dissection. It is probable that the cleaner, more complete, removal permitted by dissecting from below upward offsets the theoretical advantage of peripheral attack. It would seem advisable, therefore, to combine the methods by first isolating, ligating and dividing the spermatic vessels at their points of union with vena cava, aorta, or renal vein and then proceeding with resection of the area from below upward.

Occasionaly the glands may be so matted about the inferior mesenteric artery that in order to effect a clean removal, the artery must be sacrificed near its origin. The practicability of this procedure seems feasible on the basis of a series of cats and dogs in which this artery was ligated and cut near its origin without apparently the least untoward effects. This procedure was necessary in one personal case (Hinman Case 7; see Table V), but the patient died of acute cardiac dilatation a few hours after operation so that the efficiency of the collateral circulation in the human could not be determined.

After completion of the resection, immediate exposure on the operating table of the retroperitoneal and iliac area to roentgen radiation is an added protection against recurrence because of possible isolated cells or metastatic areas left behind. The placement of rubber tubes for drainage of the serous discharge, with exit at the back or upper end of the wound, as after kidney operations, is advantageous, and these tubes may be used, or additional ones if desirable, to carry radium for radiation of the resected area for 12 to 14 hours after operation.

SUMMARY

1. Testicular tumors affect all ages, but are most common between 20 and 50. Seminoma rarely occurs in children, while teratoma is relatively common. Duration of these tumors is variable due to the frequency of periods of latency and quiescence in their development. The duration of the growth, or its clinical characteristics furnish no index as to whether or not metastases have occurred.

2. Diagnosis is chiefly a matter of exclusion. The growth may be mistaken for, or masked by, hydrocele. Four cases of radical operation have been performed by mistake on gummata and massive tuberculosis, a fact which emphasizes the importance of careful examination of the tumor before proceeding with the radical dissection.

3. The pathogenesis of testicular tumors has long been a subject for dispute, but for clinical purposes it is convenient to divide them into two groups which occur with about equal frequency, namely, the seminoma and the teratoma. From the statistics on simple castration, teratoma gave a decidedly less favorable prognosis than seminoma. Analysis of cases of radical operation would seem to indicate an equally good prognosis for both groups.

4. Simple castration will cure 15 to 20 per cent of malignant tumors of the testis. Obviously the operation in order to effect a cure must antedate glandular or other metastases.

5. Realization of the inefficacy of simple castration has led to the development of the present radical operation which was made possible through exact knowledge of the primary lymph zones of the testicle, for which we are indebted primarily to Most (1899). This zone occupies the retroperitoneal lumbar area along the aorta and vena cava. The first successful radical operation was performed by Cuneo in France (1906), the patient remaining alive and well 3 years following the radical operation in which a metastatic lumbar gland was removed.

6. Analysis of 79 cases of radical operation shows that 9 cases had palpable metastases at the time of operation. That operation is contra-indicated in this group, is proved by the morbidity of 100 per cent. Thirteen cases revealed inoperable metastatic glands, not palpable clinically, at operation, so that a total of 22 out of 79 cases proved to be primarily inoperable.

7. Another group of 25 cases showed, on subsequent microscopic study, no metastases in the glands removed. Eight of these cases, however, died later of metastases, showing that either the gland area was not completely removed or that metastases were overlooked microscopically in those glands that were removed. Of the 25 cases, 12 remain living and well. Even granting that simple castration would have cured all of these 12 cases, the findings showing that it could have cured none of the others, it could then have cured only about 16 per cent of the entire 79 cases.

8. In still another group of 26 cases the glands removed at operation showed metastases, and all 26 obviously would be doomed by simple castration. Our analysis shows that as a result of the radical operation, however, 17 of these cases are living and well, 4 for over 4 years, and 8 for almost 3 years. It is reasonable to expect a fair proportion of the 17, who have not survived the 4 year time limit, to be cured, since recurrence generally occurs within the first year.

9. X-ray and radium seem to be valuable therapeutic and palliative adjuncts to the treatment of testicular tumors.

CONCLUSIONS

1. Seventy-nine cases of the radical operation for teratoma testis have been collected, either through personal communications, or from the literature. Ten of these comprise personal cases, 5 of which have been previously reported. It is believed that sufficient information is furnished by this material to permit of reliable analysis for comparison with the results following simple castration.

2. Comparison of results of simple castration and radical operation shows, even at this early date for the latter, an improvement in the prognosis of at least 100 per cent, since about 15 per cent of cases are cured by simple castration, whereas at least 30 per cent of the 79 cases analyzed are found to have been cured by the radical operation.

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FRACTURES OF THE ELBOW JOINT AND OF THE LOWER END OF THE HUMERUS[1]

By EDGAR LORRINGTON GILCREEST, A.B., M.D., San Francisco
Instructor in Surgery, University of California

As structure is subservient to function, it is only natural to presume that the maximum return of usefulness in a limb would be brought about by the exact reconstruction of the deformed bone, but as perfect reduction is not infrequently impossible or inexpedient, our chief aim should always be complete restoration of function.

In the consideration of types of fractures, the line of cleavage is most important. Indirect violence usually gives a spiral or torsion fracture, and there is in most cases little distortion of the limb or injury to the soft tissues. Direct violence usually produces a transverse or comminuted fracture with more deformity and soft tissue injury.

In this paper I shall confine my remarks to fractures of the elbow joint and the lower end of the humerus. My reason for so doing is that even today we see many poor functional results following such injuries. All surgeons of large experience know only too well, and often to their sorrow, that fractures in this region are notoriously liable to lead to suits for malpractice.

Fractures of the Lower End of the Humerus

ANATOMICAL CONSIDERATIONS

Two points in the anatomy of the lower end of the humerus must always be remembered: (1) The inner condyle is placed at a lower level than the outer when the arm is parallel to the erect trunk. By this arrangement the carrying angle is formed, a very necessary position to maintain after injury. (2) The articular surfaces of the humerus are fastened to the shaft of the bone at such an angle (130 degrees) that they point forward and downward instead of directly downward, as is generally supposed. A right angle reduction, therefore, does not bring forward completely the lower fragment or produce a proper tilting angle to the articulation (this explains the rationale of the Jones acute flexion treatment).

How many surgeons take time to visualize accurately the position of the displaced fragments, the aspect of the facets, the angles of obliquity, and the rotatory changes? The roentgen-ray helps us considerably in this. But as my professor of surgery at Johns Hopkins, the late Dr. William S. Halsted, was accustomed to say, "We should be on the alert that we do not allow the roentgen-ray to make us lazy"; and as Sir Robert Jones has declared, "We must beware that we do not paralyze our diagnostic faculties from pure inanition. Roentgen-rays should supplement, not usurp, other means at our disposal." Further, as Jones pointed out in a masterly address delivered before the Wigan Medical Society a few years ago: "It is impossible, in quite a number of cases in young children, despite excellent pictures, to diagnose elbow fractures by means of X-rays, and here our tactile education is invaluable." The reason for this is that the bones in early life are cartilaginous and therefore transparent.

METHODS OF PRODUCTION IN ADULTS AND CHILDREN

Fractures of the humerus in the vicinity of the elbow joint may be caused by direct or indirect violence. If an adult falls on an outstretched arm and sustains a fracture, it is usually a fracture at the base of the radius (often a Colles); if a child, the fracture usually occurs near the elbow. Therefore, the rule can be laid down that a fracture of the elbow in a child is almost always due to indirect violence transmitted through the hand and forearm to the elbow with the arm hyperextended, while the same type of injury in an adult is usually due to violence applied directly to the elbow region.

[1] Read before the Southern Surgical Association, Memphis, Tennessee, December, 1922.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 1. Case 1. Anteroposterior view of right elbow. Compound intercondylar T fracture involving joint. Note that the lower end of the humerus is fractured and driven down between the fractured and separated condyles. The proximal end sustained a subcoracoid dislocation.

Fig. 2. Case 1. Lateral view of right elbow. Note that the two lower fragments are projecting anteriorly. Usually these fragments project posteriorly.

Fig. 3. Case 1. Note how traction of pneumatic pad not only pulls down but pushes back lower fragment.

Fig. 4. Case 1. Lateral view of left elbow. Note compound fracture of olecranon process into joint.

If the fracture is in part intra-articular, on account of the intricate formation of the joint, it is very liable to lead to some permanent disability. The lower end of the humerus is structurally weak, due to the existence of various fossæ. If, as is frequently the case, fractures involve the hollows, the latter may become filled with callus. This callus later prevents complete flexion. Usually the fracture line is transverse and not infrequently it is converted into a T or Y shape by a vertical cleft running into the joint. In this way one or both condyles may be misplaced, the capitellum may be divided from the trochlea, or trochlear surface may be split. The deformity may present various conditions, and, as a rule, the lower fragment is carried backward.

VARIETIES OF FRACTURES OF THE LOWER END OF THE HUMERUS

There are actually *ten varieties* of fractures of the lower end of the humerus: (1) supracondylar; (2) diacondylar; (3) intercondylar, T, Y, or atypical; (4) separation of the lower epiphysis; (5) external epicondyle; (6) external condyle; (7) internal epicondyle; (8) internal condyle; (9) capitellum; (10) trochlea.—(Roberts and Kelly.)

1. *Supracondylar fracture.* In this form the line of fracture is usually transverse and just above the tips of the external and internal condyles. It should be distinguished from a low fracture of the shaft and from a diacondylar fracture. In all fractures of the lower end of the humerus, this type will be found in a little over one-third of the cases. This variety of fracture can be grouped into four classes: (a) extension fracture; (b) flexion fracture; (c) abduction fracture, and (d) abduction fracture.

a. In extension fractures the line of fracture runs upward and backward from a point just above the capsule anteriorly and from the external surface inward and upward. This fracture is occasioned by a fall on the outstretched hand with the elbow in hyperextension and abduction. The lower end of the upper fragment is displaced anteriorly by its fellow fragment. The reason this fracture is seen so often in children is that the capsule is stronger than attached bone. If this type is seen in adults, it is due to direct violence.

b. Flexion fractures are very rare. The line of fracture is low posteriorly, running forward and upward. The lower end of the upper fragment is displaced posteriorly.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 5. Case 1. On account of the dislocation of the shoulder this arm was put in abduction for 2 weeks in a Cleary right angle aeroplane splint with traction on forearm.

Fig. 6. Case 1. Position used at the end of 2 weeks. The flexion of the forearm was increased daily until an acute angle was obtained. Traction is exerted on a pneumatic pad in elbow.

Fig. 7. Case 1. Note sand bags in hand with hot applications on elbow joint. The method used for obtaining extension after joint has been held in acute angle for some time.

c. In the abduction fracture the line is upward and outward.

d. In the adduction fracture the line is just the reverse, that is, upward and inward.

2. *Diacondylar fracture.* Like the supracondylar type this fracture is usually transverse, but is lower, occurring just above the line of the epiphysis, and is partially intra-articular. The line of break is similar to that of the extension variety of the supracondylar type.

3. *Intercondylar, T, Y,* or *atypical fracture.* This fracture usually occurs in adults and is generally due to direct violence, and is frequently compound. The characteristic feature in this fracture is the separation of the condyles from the shaft and from each other. Often there is great displacement of the fragments and considerable traumatism to the surrounding soft tissues.

4. *Separation of the lower epiphysis* is undoubtedly very infrequent. It is observed in childhood up to the fourteenth to the eighteenth year, but usually before the age of 3. The line of separation may be through the epiphyseal cartilage or there may be attached to the epiphyseal cartilage portions of the lower end of the diaphysis. Cohn considers this really a fracture through the cartilage—a condition which might better be called a supracondylar fracture.

5. *Fracture of the external epicondyle* should be mentioned, but is rarely seen. It results from direct violence, the impact being received by the external surface of the lower end of the humerus, or from indirect violence, as when a tear fracture results from hyperadduction of the elbow. With this fracture, posterior dislocation of the radius and ulna may take place.

6. *Fracture of the external condyle.* This type occurs in about 17 per cent of the fractures of the lower end of the humerus and is most frequently seen in children. The line of break often takes a course from the joint obliquely upward and outward, and the detached fragment may consist of a part of the trochlea, the capitellum, and the epicondyle. It may result from a fall directly upon the external

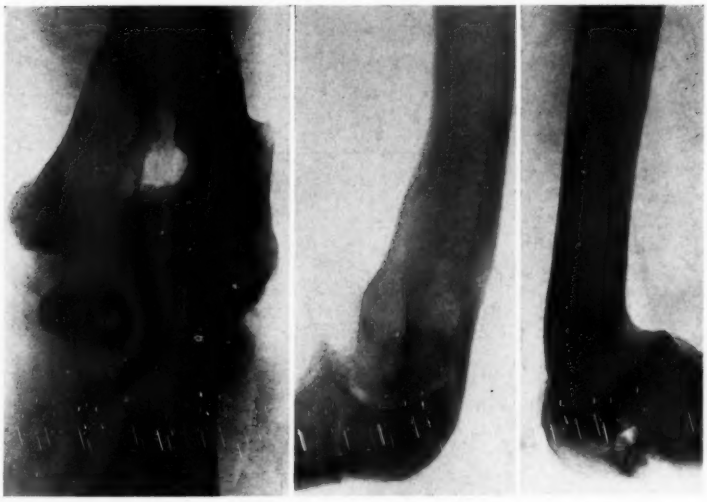

Fig. 8 (at left). Case 1. Anteroposterior view of right elbow 6 months after injury. Note how well the widely separated condyles have attached themselves to the humerus.

Fig. 9. Case 1. Lateral view of right elbow 6 months after injury. Note the perfect anatomical alignment of the two condyles with the main shaft.

Fig. 10. Case 1. Lateral view of left elbow 6 months after injury. Note that while the X-ray does not reveal perfect bony union, the functional result is perfect.

condyle; from a fall upon the hyperflexed elbow, the external condyle receiving the brunt of the impact; by hyperadduction of the elbow (tear fracture); from a fall upon the hand with the arm in full extension, the impact being transmitted through the radius to the capitellum.

7. *Fracture of the internal epicondyle.* In many instances the detached epicondyle is really a separation of the epiphysis. The fusion of the epiphysis with the diaphysis of the humerus occurs about the eighteenth year. Direct violence, such as a fall upon the arm in abduction, may produce the fracture

Fig. 11.

Fig. 11. Case 1. Note that flexion of left elbow is perfect and only slight limitation of right elbow.

Fig. 12. Case 1. Note extension of both elbows.

Fig. 12.

Fig. 13.

Fig. 14.

Fig. 13. Case 1. Note how patient can use the right elbow for eating and shaving.

Fig. 14. Case 1. Note complete re-establishment of carrying angle.

Fig. 15 (at left). Case 2. Anteroposterior view of severely comminuted fracture of lower end of left humerus. Note the spicules of bone fragments projecting into the soft tissues.

Fig. 16. Case 2. Lateral view. Note anteroposterior separation of lower fragment with the upper shaft in between. The humerus is converted into four large and several small fragments.

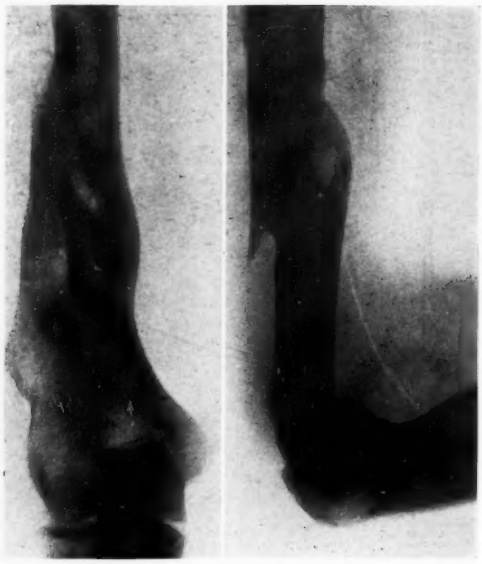

Fig. 19 (at left). Case 2. Anteroposterior view 6 months after injury. Note the alignment and attachment of fragments with the main shaft. Note that the sharp spicules of bone as shown in Figure 15 have been completely absorbed or have united with the main shaft.

Fig. 20. Case 2. Lateral view 6 months after injury. Note how the anteroposterior separation has been entirely corrected and the alignment is satisfactory.

or separation. However, the usual cause is hyperabduction of the elbow while in a position of full extension.

8. *Fracture of the internal condyle* is unusually rare. The line runs from the inner

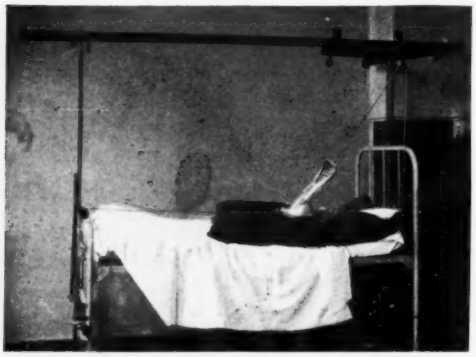

Fig. 17. Case 2. Method of traction on humerus with flexion on elbow. On account of a large wound of the axilla an ambulatory splint was not used.

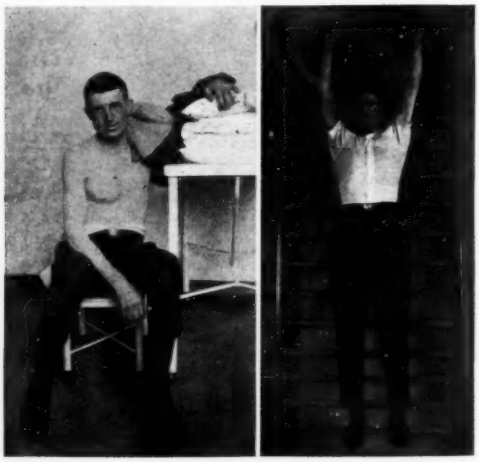

Fig. 18 (at left). Case 2. Abduction of shoulder under heat. Note sand bag on top of large hot compresses overcoming contracture in axillary region.

Fig. 21. Case 2. Exercises on stall bars for stretching scar tissue in old axillary wound.

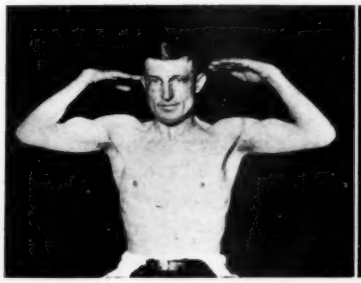

Fig. 22. Case 2. Flexion 6 months after injury.

Fig. 23. Case 2. Extension 6 months after injury.

border above the internal epicondyle downward and outward to the trochlear surface. The ulna is attached to the fragment, and both are held in fair position by the radius. If the fragment is displaced upward the carrying angle is diminished.

9, 10. *Fracture of the capitellum and trochlea.* Linden finds that the literature reveals only 17 cases of fracture of the distal articular processes of the humerus; these include fractures of either the capitellum or trochlea, or both. The lesion is a splitting of the articular surface of the bone by a fracture through the cancellous portion, the fragment consisting only of the articular cartilage and a thin strip of underlying bone.

TREATMENT

For the treatment of fractures in the vicinity of the elbow joint, with the exception of fracture of the olecranon process, the fully flexed position offers the best results. Often a splint is unnecessary, the forearm being strapped to the upper arm and fixed to the chest with a bandage. The advantages of the flexed elbow position are:

1. It gives the most complete anatomical reposition of fragments and the best fixation;
2. It favors the retention of the more important flexion function of the joint;
3. It co-operates with gravity in the subsequent restoration of function.

In correcting the initial deformity the following procedures should be carried out:

1. Strong traction is exerted on the forearm with the elbow fully extended and supinated;
2. At the same time the joint is manipulated, the displacement being corrected as far as possible; usually the upper fragment is displaced forward and the lower backward;
3. While maintaining No. 1 and No. 2, the elbow is slowly but firmly flexed to an acute angle and so fixed with the forearm supinated.

As to how long this position of acute flexion should be maintained, of course, will depend somewhat on the case, but usually after about 2 weeks the forearm can be lowered a few degrees every 4 or 5 days. This should be continued until the arm can be fully extended. However, during this process of mobilization,

Fig. 24. Case 3. Note fracture of external condyle with dislocation of forearm.
Fig. 25. Case 3. Six months after injury.
Fig. 26. Case 3. Note perfect extension.
Fig. 27. Case 3. Note perfect flexion.

Fig. 28 (at left). Case 4. Oblique supracondylar fracture. Note that the lower fragment is displaced posteriorly, which is most often found and is the reverse of condition shown in Figure 2, Case 1.

Fig. 29. Case 4. Lateral view immediately after reduction. Note complete reposition of fragments and how the position of acute flexion maintains them.

should the elbow stiffen so that the patient cannot obtain the initial degree of flexion, all movement should cease and the arm should again be put in completely flexed position and so maintained for another week. During this time gentle massage can do nothing but good.

Passive movement should begin in the fourth week and should consist of only one movement in each direction (pronation, supination, flexion, and partial extension), and then the arm should be replaced in a sling. As this movement is gently and slowly carried out by the hand, the fracture is protected from strain by the surgeon's other hand. If this passive movement produces much reaction or elicits much pain, it should not be repeated for several days. The joint should be allowed time to recover from the damage. A rebellious reaction following passive movement indicates Nature's plea for more rest and no time is saved by trying to hurry mobilization.

Cohn has pointed out that attention must be directed toward developing the external rotators of the humerus in supracondylar fractures; otherwise patients will continue to carry the arm in the position of internal rotation which will give a cubitus varus of muscular rather than bony origin. In these fractures the position of hyperflexion puts the biceps muscle on the stretch so that it acts as a natural splint.

In fractures of the internal condyle, both pronation and hyperflexion of the forearm are necessary, since muscles are more relaxed in this position and the brachioradialis and supinator brevis tend to diminish the carrying angle. In fractures of the external condyle, pronation would cause the pronator teres to pull the fragment away from the humerus.

Fractures of Upper End of Radius and Ulna

In considering fractures of the elbow joint besides those of the lower end of the humerus, there may be one (1) of the olecranon process, (2) of the coronoid process, or (3) of the head and neck of the radius.

1. *Fracture of the olecranon process* involves the elbow joint and occurs usually at the base or weakest part of the process. It is due to direct injury and is frequent in adult life.

Treatment. Extension of the elbow for 2 or 3 weeks, then begin active movements. At the end of 4 weeks the elbow can be brought to a right angle. Fibrous union with a gap is not frequent enough to warrant an immediate operation; union is nearly always satisfactory.

Whitchurch Howell reports a case in the *Proceedings of the Royal Society of Medicine* of a fracture of the olecranon process, fracture of the coronoid process and a separation of the epiphysis, which he treated in acute flexion in spite of the fracture of the olecranon.

2. *Fracture of the coronoid process* may be due to a backward dislocation of the elbow joint. Its danger is that an obstructive spur may be left in the joint or that a traumatic myositis ossificans may be produced. *Treatment* is by complete flexion.

3. *Fracture of the head or neck of the radius* is not rare. There is no room in this part of the elbow joint for even the slightest displacement or for excess of callus, so that either one may give considerable pain and mechanical disability in the flexion of the elbow and the rotation of the forearm. The fragment is usually displaced outward and forward and may be mistaken for a small piece of the external condyle. The elbow can be almost fully extended and flexed, but supination and pronation are limited.

Treatment. Full flexion for several weeks.

As it is important to limit any excess callus formation, early movement is contra-indicated. If there is actual obstruction to supination, the fractured piece should be immediately excised. In fractures of the elbow joint where sepsis is present, it is often useful to put the supinated arm in full extension and fixation in a Thomas arm-splint until the acute sepsis has been controlled or the fracture has begun to show signs of union. Nearly always, even finely comminuted fractures, in which we know a large part of the fragments are absolutely detached, if not infected, unite very rapidly, forming a large callus. The arm should then be gradually flexed, maintaining the supination. It is unwise to leave the arm extended more than one month for fear of bony ankylosis in this awkward position.

May I be pardoned for saying just a word as to the time for reduction of fractures? As pointed out by Blake, many still think that a fracture can be reduced at any time within the first 10 or 12 days. It is an erroneous and pernicious idea to wait until the swelling subsides. Early reductions often prevent much swelling. Repair does not go on indefinitely; sooner or later it ceases; therefore, it must be conserved and not wasted.

COMPLICATIONS

The possibility of such complications as

1. Volkmann's contracture,
2. Traumatic myositis ossificans,
3. Ulnar nerve or median nerve injury.
4. Permanent restriction of movement from excessive callus formation in the fossæ,

should make the surgeon treating fractures in the vicinity of the elbow joint always on the alert to prevent them.

The possibility of Volkmann's ischæmic paralysis should always be kept in mind, particularly in children. It can be largely prevented by (1) leaving no pad in the elbow, or, if one is necessary, a pneumatic pad, as shown in the photograph; (2) having no constricting band or bandage about the joint; (3) seeing that the angle of flexion is not too extreme.

INDICATIONS FOR OPERATION

Besides (1) removal of the head of the radius, as mentioned above, Stone has called attention to one group of cases requiring open reduction, namely: (2) those in which the epiphysis has been detached and has turned turtle, for replacement by manipulation in such cases is usually impossible; (3) fractured fragments of the capitellum and trochlea should be excised; (4) co-existing nerve injury should be a clear indication for operation. If operation is indicated, it should be done at the earliest possible moment. One should try to be clear in his mind and decisive in his action whether or not he will treat a case by closed or open reduction. Rixford, in his excellent article "On the Mechanics of Production and Treatment of Spiral Fractures," has emphasized that "the open operation should not be relegated to the position of last resort."

Among the French and Belgians, Lambotte is an uncompromising advocate of the open operation, and among the Germans, Bardenheuer takes an extremely conservative position, while Robert Jones, of England, assumes a position between the two. I believe that too many American surgeons are not sufficiently trained in the methods of traction, or have not enough patience in the treatment by closed methods, and, therefore, resort to open operation too frequently. This is due to the fact that fractures in our medical schools are treated often under the head of minor surgery, and are often below the attention of the professor of surgery, who confines himself largely to the more dramatic anatomical area, the abdomen.

We should never lose sight of the fact that some of the ugliest and anatomically poorest appearing elbows may possess remarkable movement, while many elegantly shaped joints may be practically devoid of it. This should be clearly explained to the patient by the surgeon to avoid criticism later. It should also make us think twice before we operate and introduce screws, silver wire, bands, and Lane plates.

The ultimate attainable aim in the treatment of fractures of the elbow joint must be the formation of a normal joint. If, when the fracture is healed, the range of motion is sufficient to bring the hand to the mouth in flexion and to place it in the trousers' pocket

in extension, the result is considered satisfactory.

In conclusion, by way of emphasis, I wish to state that only recently I was called in consultation to see a young woman who had sustained, a year or two previously, a comminuted fracture of the lower third of the humerus, not as severe as shown on the accompanying photograph. No attempt was made to reduce the fragments by traction and flexion. An open operation was performed and a band applied. This became loose afterward and a second operation was performed and a Lane plate inserted. A third operation followed, and this time silver wire was the metal of choice. Sepsis occurred and the wound did not heal for months. When I saw the case the greater part of the lower third of the humerus had been destroyed and the girl's chance of having a normal arm was gone forever. Bone grafting offered the only chance of securing for her an arm at all. This is just one of many cases, such as all of you have seen. But should not such cases make us stop and think what we can do to prevent, as far as possible, the ruthless open operation on fractures? We hear a great deal among the internists about preventive medicine; should we not hear more among surgeons about preventive surgery, especially in the treatment of fractures?

CASE 1. *Compound intercondylar T fracture involving joint.* This fracture is exceedingly interesting. It occurred in a man, age 58, weighing 220 pounds, who was hurled 15 feet from a revolving wheel. He sustained seven fractures, three of them compound, and two dislocations. The right arm, shown in Figure 1, evidently received more than its share of the impact, as he sustained a transverse fracture of the lower third of the humerus with a splitting fracture extending down into the joint, converting it into a complete compound intercondylar T fracture and separating the condyles widely. The head of the humerus on the same side was dislocated. When the condyles are so widely rent asunder we can be absolutely certain the two lateral ligaments have been extensively ruptured. In this case the shaft was, as it were, driven down between the separated condyles.

The problem which presented itself in this right arm alone was the reduction and treatment of the dislocated shoulder, the reduction and treatment of the compound intercondylar T fracture of the elbow joint and the prevention of sepsis to the joint. The arm was put in a right angle abduction aeroplane splint with traction on the forearm for 2 weeks. During this time, as you will see from Figure 3, the forearm was in pronation. The wounds were treated with dichloramine-T. The arm was then taken down and put in a Jones right angle splint. The problem then was to bring about four things, namely: (1) to still further correct the shortening; (2) to push the upper fragment forward and the lower fragment backward; (3) to obtain as quickly and as completely as possible the angle of acute flexion; and (4) to secure complete supination of the forearm. The accompanying photographs tell the story of how this was accomplished.

This man made practically a complete recovery and was back at work in less than a year from the date of injury. The only residue which remained of his multiple fractures was a slight limitation of flexion and extension of his right elbow. This, as you see by the photographs, was so slight that he can easily flex his arm to eat or shave, and readily put his hand in his trousers' pocket.

CASE 2. *Severely comminuted fracture of the lower third of humerus.* This occurred in a man, age 30, and was the result of a heavy log rolling over his arm. The humerus, as you will see, was broken into six fragments, with several small spicules projecting out into the muscles. This fracture was complicated by a large infected wound of the axilla of the same side. The accompanying photographs show that this arm was treated by flexion and traction with practically a 100 per cent recovery of all movements (Figs. 15 to 23). The mistake is often made in this type of fracture of applying metal bands or silver wire. Traction makes the biceps and triceps muscles natural splints which mold these fragments together. The small spicules of bone in the muscles should cause us no alarm, as they are later absorbed.

CASE 3. *Fracture of the external condyle with dislocation of the forearm.* This occurred in a child of 2 years who was seen immediately after injury. Supination, traction, and flexion of the forearm gave a complete reduction with a perfect ultimate recovery, as shown in Figures 24 to 27.

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ACUTE (PUERPERAL) INVERSION OF THE UTERUS

With Report of Two Cases

By E. EVANS, M.D., La Crosse, Wisconsin

INVERSION of the uterus (puerperal) is very rare. I quote the following statistics:

W. Nacke, Leipsig, 1916, says 1 case in 10,000; H. Riddlinger, Leipzig, says that from 1878 to 1919 they had 6 cases in 67,091 births, or 1 in 12,000; E. E. Welponer, Triest, 1918, says from 1885 to 1914, there were no cases in the clinic in 1,302 deliveries, but he had records of 5 cases that occurred in the city; Ahlfeld, Leipzig, reports it as occurring once in 100,000 cases; Zangemeiski says 1 in 400,000 cases; von Brun in Vienna Clinic, says there were no cases in 250,000 births; Kehrer saw 1 case in 2,000 births.

Other writers report it as exceedingly rare. The average was given by Jones as 1 in 128,767 labors.

The case forming the basis of this paper is briefly as follows:

Mrs. S., age 23, primipara, delivered noon September 26. Normal delivery; placenta delivered manually within a very short time. (May say that the accoucher had acute suppurative otitis media at the time.) Patient seemed well for 4 hours, when the untrained woman in attendance noticed some blood clots and a large mass between her thighs. No attention was given to this until 4 o'clock the next morning (12 hours later), when a trained nurse was called and noticed this condition and immediately called the medical attendant, who cleaned away the blood and pushed the mass back into the vagina; said he did not know what was wrong, and a consultant was called, who sent patient to the hospital where she arrived 28 hours after probable time of inversion.

On entrance patient was pale, weak, pulse 120, temperature 100 (rectal), blood hæmoglobin 62 per cent, red blood cells 2,790,000, white cells 23,800. The uterine body could not be felt in the abdomen. A large mass was felt filling the vagina, evidently the inverted uterus.

Operation. Gas-oxygen-ether anæsthesia; on examining the mass in the vagina much blood was wiped away from about it, and the raw surface of the placental site was on the fundus. The abdomen was opened through a small incision, the cervix dilated by the operator first inserting his index fingers and then an assistant doing the same, thus with the four fingers stretching the cervix. A second assistant with his hand in the vagina rather easily re-inverted the uterus. It was interesting to note how the re-inversion occurred, beginning first on the posterior wall near the cervix and gradually rolling in until there was full reposition. The uterus then looked perfectly normal, as did the tubes and ovaries. The patient continued to have the same temperature, about, as she entered with from September 27 to October 9. She was feeling very well and nursing her child.

October 9, she had a chill followed by temperature of 103°. Examination of the abdominal wound and the pelvis showed no apparent cause for the fever and inasmuch as the patient had a painful infected tooth, we suspected that this might be the cause of the fever and had it pulled.

For the next 5 days patient felt better and nursed her child up to October 16, when she had a temperature of 104.6° and from this date until October 31, patient continued with a high fever and was exceedingly ill, and developed a severe phlebitis of the left leg, and later a slight phlebitis in the right leg. During this time, involution was taking place. There was no tenderness in the abdomen, the lochia was foul at no time, and the only pelvic finding was some tenderness and infiltration on the left side, when the phlebitis was at its height.

On November 23 phlebitis had cleared up nicely, and patient had been sitting up a few days when she developed a severe pain in the right hip joint. After a few days' observation a Buck's extension was put on the right leg and very shortly the pain and tenderness disappeared. At this time (December 6), there was considerable enlargement of the spleen, but the uterus was well involuted, in good position, movable, and there was no pelvic infiltration.

December 15, patient discharged, feeling well, there is no swelling of the limbs, no tenderness in the right hip, pelvis is normal on examination, splenic enlargement has disappeared, blood examination is as follows: hæmoglobin 58 per cent, red blood cells 2,540,000, white blood cells 8,800.

The second case I saw several years ago, and reposition had been effected by the nurse before my arrival at hospital, the doctor in the meantime standing by non-plussed and helpless.

The literature on inversion is as voluminous as the condition seems rare. Dr. Peterson, of Ann Arbor, in Surgery, Gynecology

AND OBSTETRICS, 1907, wrote an extensive paper on chronic inversion and his bibliography includes 84 references.

In 1913 W. C. Jones, of Chicago, published a paper in SURGERY, GYNECOLOGY AND OBSTETRICS, in which he detailed a very interesting case, reviewed the literature very thoroughly, and his bibliography includes 250 references, many of them, however, the same as Peterson's. He gives credit to W. Thorn, Germany, for the best analysis of the subject in a series of papers in German literature from 1898 to 1912.

I have been able to collect reports of 61 cases of acute puerperal inversion since 1913, but feel sure that the bibliography is far from complete.

Much has been written about how inversion occurs, but that relaxation of the uterus from any cause, especially a long tedious labor or sudden profuse hæmorrhages, is the prime predisposing cause, seems certain.

Improper delivery of the placenta either by expression on the fundus or traction on the cord seems to be in many, if not most, cases the direct cause of inversion. However, a very considerable number of cases of inversion where such methods were not used, where the placenta was delivered spontaneously or where the inversion occurred with the placenta still adherent (18 of the 61 cases) proves that neither expression nor traction is necessarily a factor in its occurrence.

Where inversion occurs with the placenta attached, it is interesting to note that this attachment is most frequently fundal. Since the uterine wall is thinner and weaker at the placental attachment, if this attachment is fundal the most favorable condition occurs for inversion, which probably always begins by dimpling or indentation at or near the fundus. If this is true, the rarity of fundal attachment of the placenta as noted by E. Bumm, 1908, quoted by Huntington in *Boston Medical and Surgical Journal*, 1921, would account for the rarity of inversion.

Following is shown an analysis of the 61 cases of acute puerperal inversion which I have been able to find since the publication of Jones' paper in 1913.

CASE 1. Reported by M. B. De Bangra, An. Fac. de Med., 1920. No details given as to delivery of child. Posterior hysterotomy done; result not stated.

CASE 2. Reported by J. Barris and M. Donaldson, Proc. Roy. Soc. Med., London, 1920. Patient III-para. Delivery normal, Credé with traction on cord, unattached placenta. Aveling's repositor used in seventh week; patient recovered.

CASE 3. Reported by G. M. Boyd, Am. J. Obst., 1920. Patient III-para. Child delivered by forceps; manual extraction of attached placenta. Seven hours later abdominal section done; patient recovered.

CASE 4. Reported by J. P. Cohen, Boston M. & S. J., 1922. Patient I-para. Child delivered by forceps, Credé method, placenta attached. Abdominal section 9 hours later; patient recovered.

CASE 5. Reported by C. Culbertson, Surg. Gynec. & Obst., 1920. Patient I-para. Forceps delivery, manual extraction of unattached placenta. Posterior colpohysterotomy; patient died.

CASE 6. Reported by O. T. Dinnik, Proc. Roy. Soc. Med., London, 1917. Patient I-para. Delivery normal; manual extraction of attached placenta in 24 hours. Total hysterectomy; result not reported.

CASE 7. Reported by F. Engelman, Zentralbl. f. Gynaek., 1920. Patient multipara. Delivery normal, Credé extraction of unattached placenta. Immediate manual reposition; patient recovered.

CASE 8. Reported by Quante, Zentralbl. f. Gynaek., 1920. Patient I-para. Delivery normal, Credé extraction of unattached placenta; patient died 24 hours later.

CASE 9. Reported by W. G. Evans, Lancet, Lond., 1920. Patient I-para. Delivery normal, spontaneous expulsion of unattached placenta. Immediate manual reposition; patient recovered.

CASE 10. Reported by Gascon, Rev. de clin. et de therap., 1921. Patient I-para. Delivery normal; spontaneous expulsion of unattached placenta. Manual reposition in 3 minutes; phlebitis; patient recovered.

CASE 11. Reported by J. M. Griffin, Am. J. Obst., N. Y., 1917. Patient I-para. Child delivered by forceps; Credé extraction of attached placenta with traction on cord. Immediate reposition by taxis; phlebitis. Patient recovered.

CASE 12. Reported by F. Campbell, J. Am. M. Ass., 1921. Patient I-para. Delivery normal; normal extraction of unattached placenta. Inversion on seventeenth day, immediate manual reposition. Patient recovered.

CASE 13. Reported by J. Huntington, Boston M. & S. J., 1921. Patient III-para. Child delivered by forceps. Normal extraction of unattached placenta. Abdominal section; patient recovered.

CASE 14. Reported by J. Huntington, Boston M. & S. J., 1921. Patient I-para. Normal delivery, incomplete extraction of attached placenta. Hysterectomy on fifth day; on sixteenth day patient died.

CASE 15. Reported by G. Iurcev, Wien. klin. Wchnschr., 1918. Patient II-para. Delivery normal; traction on cord, placenta unattached. Manual reposition; patient died in 2 hours.

CASE 16. Reported by G. Iurcev, Wien. klin. Wchnschr., 1918. Patient multipara. Delivery normal, normal extraction of unattached placenta. Patient died before reposition was attempted.

CASE 17. Reported by G. Iurcev, Wien. klin. Wchnschr., 1918. Patient multipara. No details as to delivery of child or extraction of placenta given. Hysterectomy done on third day; patient died.

CASE 18. Reported by G. Iurcev, Wien. klin. Wchnschr., 1918. Delivery normal, extraction of unattached placenta normal. Manual reposition on third day. Recovery.

CASE 19. Reported by G. Iurcev, Wien. klin. Wchnschr., 1918. Patient I-para. Delivery of child normal, normal extraction of unattached placenta. Vaginal hysterectomy in third week; patient recovered.

CASE 20. Reported by G. Iurcev, Wien. klin. Wchnschr., 1918. Delivery normal; normal extraction of unattached placenta. Anterior colpotomy done. Patient recovered.

CASE 21. Reported by von Jaschke, Deutsche med. Wchnschr., 1919. Patient multipara. Delivery normal. Credé extraction of unattached placenta with traction on cord. Immediate manual reposition. Patient recovered.

CASE 22. Reported by W. L. Knipe, Am. J. Obst., 1917. Normal delivery of child. Attached placenta peeled off. Immediate manual reposition. Patient recovered.

CASE 23. Reported by J. A. Maclay, J. M. Ass. New Jersey, 1918. Patient I-para. Delivery spontaneous; spontaneous extraction of unattached placenta. Reposition partially spontaneous, partially manual. Patient recovered.

CASE 24. Reported by R. A. Malcolm, M. J. Australia, 1917. Patient multipara. Delivery normal; spontaneous extraction of unattached placenta. Reposition not attempted. Patient died in 3 minutes.

CASE 25. Reported by W. P. Manton, M. J. New York, 1921. Patient multipara. Delivery normal, Credé extraction of placenta with force. Immediate manual reposition. Patient recovered.

CASE 26. Reported by W. P. Manton, M. J. New York, 1921. Patient I-para. Child delivered by forceps; spontaneous delivery of unattached placenta. Manual reposition second day. Patient recovered.

CASE 27. Reported by T. Micholitsch, Zentralbl. f. Gynaek., 1920. Patient I-para. Delivery by forceps. Attached placenta adherent. Immediate manual reposition. Patient recovered.

CASE 28. Reported by W. Nacke, Zentralbl. f. Gynaek., 1919. Patient II-para. Delivery normal; attached placenta adherent. Posterior hysterectomy done; patient recovered.

CASE 29. Reported by G. Shoemaker, Am. J. Obst., 1917. Patient III-para. Delivery normal; normal extraction of unattached placenta. Spinelli operation done; patient recovered.

CASE 30. Reported by H. R. Spencer, Proc. Roy. Soc. Med., Lond., 1919. Patient XII-para. Delivery unassisted. Attached placenta adherent 19 days. Spontaneous reposition on forty-first day. Patient recovered.

CASE 31. Reported by H. R. Spencer, Proc. Roy. Soc. Med., Lond., 1919. Patient multipara. Delivery spontaneous. Normal extraction of unattached placenta. Aveling's repositor used for ¾ hour on eleventh day. Patient recovered.

CASE 32. Reported by H. R. Spencer, Proc. Roy. Soc. Med., Lond., 1919. Patient I-para. Spontaneous delivery, normal extraction of unattached placenta. Aveling's repositor used for 5½ hours on twenty-second day. Patient recovered.

CASE 33. Reported by H. R. Spencer, Proc. Roy. Soc. Med., Lond., 1919. Patient multipara. Spontaneous delivery, normal extraction of unattached placenta. Aveling's repositor used 2 years, 8 months later. Recovery.

CASE 34. Reported by H. R. Spencer, Proc. Roy. Soc. Med., Lond., 1919. Spontaneous delivery of child, normal delivery of unattached placenta. Aveling's repositor used 7½ hours after 9 months. Patient recovered.

CASE 35. Reported by M. A. Swiney, J. M. Ass. New Jersey, 1922. Patient I-para. Delivery by forceps. Normal extraction of unattached placenta. Immediate manual reposition. Patient recovered.

CASE 36. Reported by Townesend-Whitling, Lancet, Lond., 1920. Patient I-para. Normal delivery; spontaneous extraction of unattached placenta. Immediate manual reposition; patient recovered.

CASE 37. Reported by A. von Valenta, Gynaek., Berl. u. Wien., 1917. Normal delivery; traction on cord, placenta attached. Hysterectomy done; patient recovered.

CASE 38. Reported by J. A. Watson, Brit. M. J., 1919. Normal delivery; normal extraction of unattached placenta. Immediate manual reposition; patient recovered.

CASE 39. Reported by R. Worrall, M. J. Australia, 1922. Patient I-para. Normal delivery, normal extraction of unattached placenta. Reposition not attempted; immediate death.

CASE 40. Reported by R. Worrall, M. J. Australia, 1922. Patient multipara. Normal delivery, normal extraction of unattached placenta. Manual reduction; patient recovered.

CASE 41. Reported by R. Worrall, M. J. Australia, 1922. Patient I-para. Delivery of child with forceps. Credé extraction of attached placenta. Piccoli's operation done, patient recovered.

CASE 42. Reported by H. W. Yates, J. Michigan M. Soc., 1920. Normal delivery; Credé extraction of attached placenta and traction on cord. Manual reposition after 20 hours. Patient recovered.

CASE 43. Reported by W. G. Williams, Brit. M. J., 1915. Patient III-para. Normal delivery; normal extraction of unattached placenta. Uterus ruptured from vagina and expelled. Patient died.

CASE 44. Reported by Peter Stewart, Brit. M. J., 1916. Patient I-para. Delivery with forceps; normal extraction of unattached placenta. Manual reduction 8 hours. Patient recovered.

CASE 45. Reported by F. L. Pochin, Brit. M. J., 1915. No details of delivery were given. Manual reduction. Patient recovered.

CASE 46. Reported by James Oag, Brit. M. J., 1915. Patient II-para. Normal delivery; attached placenta adherent. Manual reposition after 1 hour. Patient recovered.

CASE 47. Reported by C. G. Kurien, Brit. M. J., 1915. Patient I-para. Delivery of fetus and placenta intact; placenta unattached. Manual reduction in 15 hours; patient recovered.

CASE 48. Reported by E. Holland, Brit. M. J., 1915. Delivery normal; attached placenta adherent. Immediate manual reposition. Patient recovered.

CASE 49. Reported by M. Pasman, Semana méd., 1921. Patient II-para. Delivery spontaneous; spontaneous expulsion of unattached placenta. Vaginal hysterectomy done. Patient died.

CASE 50. Reported by J. H. Hobbing, Brit. M. J., 1915. Normal delivery; no details given as to placenta. Immediate manual reposition. Patient recovered.

CASE 51. Reported by D. J. McAfee, Brit. M. J., 1913. Patient V-para. Delivery normal; placenta expressed; immediate reposition by taxis. Patient recovered.

CASE 52. Reported by J. Edge, Brit. M. J., 1914. No details given of delivery and placenta. Reduction on third day; patient recovered.

CASE 53. Reported by C. Carruthers, Brit. M. J., 1915. Patient II-para. Delivery with forceps; attached placenta adherent. Immediate manual reposition. Patient recovered.

CASE 54. Reported by C. Carruthers, Brit. M. J., 1915. Patient III-para. Delivery normal; attached placenta adherent. Manual reduction same patient as above. Patient recovered.

CASE 55. Reported by E. Evans, Western Surg. Conf., 1922. Normal delivery; manual extraction of placenta. Laparotomy done. Patient recovered.

CASE 56. Reported by E. Evans, Western Surg. Conf., 1922. Normal delivery; manual extraction of placenta. Immediate manual reposition. Patient recovered.

CASE 57. Reported by James P. Aylen, Fargo, N. D. Personal communication. Mrs. L. C., age 25, I-para. Normal labor December, 1912. Severe hæmorrhage, uterine inversion. Operated upon February 25, 1913, reduction after laparotomy. Patient died February 25, 1913, of shock.

CASE 58. Reported by James P. Aylen, Fargo, N. D. Personal communication. Patient age 17, I-para, December 5, 1915, in hospital. One week after going home felt mass in vagina which soon protruded. Operated December 29, abdominal incision. Patient recovered.

CASE 59. Reported by James P. Aylen, Fargo, N. D. Personal communication. Mrs. R. G., age 29, I-para; delivery November 6, 1920. November 7 severe bearing down pains, extrusion of inverted uterus. Great shock. Replacement by taxis. Died 1 hour later.

CASE 60. Reported by George Gay, Richmond, Virginia. Personal communication. Patient 30 years of age. Precipitate labor. Complete inversion. Placenta immediately removed, uterus replaced manually. Patient recovered.

CASE 61. Reported by George Gay, Richmond, Virginia. Personal communication. French poodle dog, delivered of two puppies. Severe bleeding, complete inversion of uterus, placenta attached. Placenta removed and uterus reinverted. Dog recovered.

The method of treatment used and the results obtained in these 61 cases are as follows (so far as given in reports):

	Cases	Deaths
Abdominal laparotomy	6	1
Vaginal hysterectomy	5	4
Anterior colpohysterotomy	3	0
Posterior colpohysterotomy	3	0
Manual reposition	31	5
Aveling's repositor	5	0
Spontaneous reduction	2	0

Somewhat peculiar and sometimes startling methods have been used for reposition. Aveling's repositor, with variously modified cups to fit the fundus of the inverted uterus, or perhaps to fit the ill-conceived mechanical conception of the operator, has been used quite often. A potato masher and an ebony ruler have been used. A noted gynecologist in the late years of the nineteenth century used elastic compression to reduce the size of the uterus with resulting necrosis requiring vaginal hysterectomy.

One of the surprising things is the number of cases that spontaneously re-invert, not infrequently while the attendant is waiting for a favorable condition to attempt reposition.

That tragedies have occurred in connection with this fortunately rare condition (mentioned by Hippocrates and doubtless occurring eons before his time) may be gathered from the following unique cases.

CASE 1. E. H. Smith, *British Medical Journal*, 1897, was called by midwife, who had found a mass between the thighs of the patient and believing this to be the placenta, had pulled on the inverted uterus for three quarters of an hour until the uterus, one tube, and one ovary came away. On examination he found the other tube and ovary congenitally absent. He closed the peritoneal cavity and repaired the vagina, and the patient made a complete recovery.

Case 2. Dr. N. G. Williams, *British Medical Journal*, 1915, gives the following case: III-para delivered by midwife, at 6:30; placenta expelled normally. At 7:15 midwife saw what she thought was a second child and sent for the doctor, who arrived at 7:30. He was shown two basins, the placenta in one and the contracted uterus in the other, which had separated at the cervix. The woman died soon after his arrival.

CASE 3. Dr. W. C. Jones, Chicago, SURGERY, GYNECOLOGY AND OBSTETRICS, June 30, 1913, reports the case of a woman who, in her ninth pregnancy, had a normal labor and puerperium up to the tenth day. On the fourteenth day she had severe pains; the doctor (not Jones) found inverted uterus in the vagina. On the seventeenth day he took her to the hospital; and on the eighteenth day the doctor (not Jones) amputated the mass in the vagina as high in the vaginal vault as possible. There was some prolapse of the omentum which he corrected and the patient was put to bed. On July 30, Dr. Jones was called and found pelvic infection and did a laparotomy and removed the right tube and both ovaries, and evacuated 3 ounces of pus and used both abdominal and vaginal drains. The left tube had been removed at previous operation, and examination of the specimen showed it to be the inverted uterus with a fibroid attached to its fundus.

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Dr. W. C. Jones, Chicago, in 1913, published a paper in SURGERY, GYNECOLOGY AND OBSTETRICS in which he detailed an interesting case and reviewed the literature very thoroughly. His bibliography includes 250 references, some of which are duplicates of Peterson's.

CHEMICAL CHANGES IN THE BLOOD OF MAN AFTER ACUTE INTESTINAL OBSTRUCTION

AN INDICATION FOR TREATMENT WITH SODIUM CHLORIDE

BY RUSSELL L. HADEN, M.A., M.D., AND THOMAS G. ORR, M.D., F.A.C.S., KANSAS CITY, KANSAS
From the University of Kansas, School of Medicine

IN a recent publication (1) we have called attention to transitory reactions following gastro-enterostomy which were associated with a rise in the non-protein nitrogen of the blood, a rise in the carbon dioxide combining power of the plasma, and a fall in the blood chlorides. The urine showed an increase in the non-protein nitrogen and a marked diminution in the chloride excretion. We have interpreted these changes as due to an intoxication caused by a temporary obstruction, or partial obstruction of the duodenum, probably at the gastro-enterostomy stoma.

SUMMARY OF EXPERIMENTAL STUDIES

The increase in non-protein nitrogen in the blood of animals with experimental intestinal obstruction was first observed by Tileston and Comfort (2) and later by Whipple (3) and his co-workers. We have studied the blood and urine of dogs with both pyloric (4) and small bowel obstructions (5).

Dogs which were afflicted with untreated pyloric or duodenal obstruction died, on an average, in 4 days. They all showed a fall in the chlorides of the blood usually with a coincident rise in the carbon dioxide combining power followed by a marked rise in the non-protein nitrogen. In the urine of these dogs was found a high level of non-protein nitrogen and an almost total absence of chlorides.

Dogs with pyloric obstruction treated with 50 cubic centimeters of 10 per cent sodium chloride solution daily, beginning at the time of operation, did not show the blood changes noted above. Other dogs with obstruction of the duodenum for 48 hours, showing typical blood changes and treated with 50 cubic centimeters of 10 per cent sodium chloride daily, showed a rapid return of blood to normal. The strong solution of sodium chloride was used to eliminate the question of liquid as a factor in the change in the blood.

Dogs with pyloric obstructions showing marked blood changes, as has been stated, got entirely well after release of the obstruction in 48 hours and subsequent treatment with 10 per cent sodium chloride. Dogs treated with 25 per cent glucose or plain water developed the changes as rapidly as those having no treatment. Dogs in which pyloric obstruc-

TABLE I

Case.	Day of examination	Blood (mgms. per 100 cm.)						Urine (mgms. per 100 cm.)	
		Non-protein nitrogen	Urea nitrogen	Chlorides	CO_2 combining power	Uric acid	Creatinine	Non-protein nitrogen	Chlorides
	Normal (Hosp. diet)	25–35	10–15	450–550	50–75	1–4	1–2	5–12	5–10
1.	Day of operation	104.0	37.3	410	36.2	3.8	2.0		
	Day after operation 2	57.5	27.9	410	73.0	5.9	1.6		
	3	60.0	18.3	340	80.6	6.7	1.6	(3.5%)	(.05%)
	4	50.0		380		3.8	1.3		
	5	32.7	8.4				1.9	(2.2%)	(.06%)
	7	45.6	14.0		80.6	3.2	1.7		
	9	54.6	20.1	440	57.9	2.8	1.7		
	10							3.3	.62
	11							5.5	2.5
	12							4.6	2.4
	13							5.0	6.1
	14							7.3	6.6
2	Day before operation 1	107.0		400	34.7		2.5		
	2	107.5	45.5	500	41.0	3.0	2.1		
	Day of operation 0	62.0	32.2	500	43.9	1.9	1.6	23.8	1.8
	Day after operation 1	55.0	28.0	440	40.3	1.2	1.8	7.0	2.3
	2	68.0	34.9	580	46.7	1.4	1.6		
	3	79.8	38.5	570	48.6	1.4	1.8	24.4	4.1
	4	75.0	35.2	460	34.7	1.4	1.8	9.3	2.9
	5	111.0	56.7	320	42.8	2.4	1.8	9.3	0.7
	6							6.6	0.2
	7	61.5	32.6	380	31.9	2.2	1.5	8.8	0.7
	8	61.5	34.0	490	31.9	2.7		9.4	5.5
	9							6.3	1.0
	10	58.8	37.3	450	38.1	3.8	1.7	9.6	0.5
	11							12.7	0.5
	12							12.0	0.3
	13							2.1	0.15
	14							1.2	0.06
3.	Single examination		20.5	410	47.5		1.5		(0.07%)
4.	Single examination	57.8	28.5	370	38.1		1.5		

tion was released and which had no further treatment, showed a continuation of the high non-protein nitrogen in the blood, indicating that the toxæmia was still present even several days after the obstruction had been removed.

Two dogs in which the duodenum was sectioned and the cut ends inverted were given 500 cubic centimeters of 0.85 per cent sodium chloride subcutaneously on the day of operation and each day thereafter until death. One dog lived 21 days and the other 28 days. A marked alkalosis was present in each, but there was no rise of non-protein nitrogen in the blood or fall in the chlorides. Dogs treated daily with like quantities of plain water, 2 per cent glucose solution and 1 per cent sodium bicarbonate, all showed the blood changes of untreated duodenal obstruction and died in 1 to 9 days after operation. Hartwell and Houget (6) in 1912 kept dogs with duodenal obstruction alive for three weeks with physiological saline solution. They attributed death in intestinal obstruction to dehydration of the tissues and concluded that their dogs were kept alive by the administration of water. We believe that we have definitely proven the sodium chloride to be the chief factor in combating the toxæmia in these cases.

The following brief case reports are presented to show the blood changes after intestinal obstruction in man and, in one case, to show the effect of the administration of sodium chloride upon the blood findings.

CASE 1. M. K., a housewife, age 36, was admitted to the Surgical Service of Dr. M. T. Sudler, Bell Memorial Hospital, June 20, 1922, with a typical history of intestinal obstruction lasting 40 hours. At operation an obstruction due to an enterolith was found in the ileum about 3 feet from the cæcum. The gut above the obstruction appeared completely paralyzed. The blood showed a rise in non-protein nitrogen to 104 milligrams per 100 cubic centimeters, urea nitrogen 37.3 milligrams per 100 cubic centimeters, carbon dioxide combining power of the plasma 36.2 volume per cent and a chloride of 410 milligrams per 100 cubic centimeters. During

the next 4 days the chlorides dropped to 340 and the carbon dioxide combining power rose to 80.6. During this time 3,000 cubic centimeters of physiological saline solution were given by hypodermoclysis. On the fourth day after operation the urine contained 0.05 per cent of chloride. Even after the obstruction was relieved and the patient well on the road to recovery, the non-protein nitrogen and carbon dioxide remained higher and the chlorides lower than normal, showing the slowness with which the body tissues regain their chemical equilibrium. (See table, Case 1.)

CASE 2. A. J., a laborer, age 50, was admitted to the Bell Memorial Hospital, with a history of intestinal obstruction for 5 days. The general condition of the patient was so serious that operation was temporarily postponed. The blood showed 107 milligrams of non-protein nitrogen per 100 cubic centimeters, carbon dioxide combining power of plasma of 34.7 volume per cent and chlorides 400 milligrams per 100 cubic centimeters. The day after admission an enterostomy was done which did not drain and another was done the following day. During the first 36 hours of the patient's stay in the hospital, 90 grams of sodium chloride were given him by hypodermoclysis in a 3 per cent solution with but 1.8 grams appearing in the urine. At the end of this time the blood chloride had risen to 500 milligrams per 100 cubic centimeters, the carbon dioxide combining power to 43.9 and the non-protein nitrogen had dropped to 62 milligrams per 100 cubic centimeters. After the fifth day the chlorides dropped below normal and remained below that level until death. An average of 1,000 cubic centimeters of physiological saline was given daily after the fifth day which was not sufficient to maintain the chlorides at a normal level. The chloride excretion continued very low. On about the fifth day after operation the patient developed a peritonitis due to a leakage from the first enterostomy which resulted in his death at the end of 15 days.

CASE 3. H. Y., a school boy, age 17, was seen in consultation at National Military Home, Kansas. He had a typical intestinal obstruction of the lower ileum following a suppurative appendicitis 6 weeks before. Blood for a single examination was taken 36 hours after the first symptoms of abdominal pain before distention had become marked. The urea nitrogen was 20.5 milligrams per 100 cubic centimeters, the chlorides 410 and the carbon dioxide combining power of the plasma 47.5 volume per cent. A specimen of urine taken at the same time showed only 0.07 per cent of chlorides. The patient died following an operation for relief of the obstruction.

CASE 4. E. D., age 26, was operated upon at the U. S. Veterans' Hospital, Kansas City, Missouri, February 2, 1923, and a volvulus 20 centimeters in length found about 8 centimeters from the ileocæcal valve. The duration was 30 hours. Fifteen hours after operation blood was taken for a single chemical analysis. It showed a non-protein nitrogen of 57.8 milligrams per 100 cubic centimeters, chlorides of 370 and carbon dioxide combining power of 38.1. Up to this time no sodium chloride had been given except a small quanity of physiological saline by rectum. This patient recovered.

The clinical cases of acute intestinal obstruction reported show a definite and constant change in the blood chemistry by a fall in the blood chlorides with a frequent coincident rise in the carbon dioxide combining power of the plasma and a rise in the non-protein nitrogen and urea nitrogen of the blood. The urine has an increased non-protein nitrogen content and a great reduction in total chlorides.

These chemical changes are due to the action of some toxic body which is absorbed into the blood stream subsequent to intestinal obstruction, the nature of which is not known. The rise in non-protein nitrogen in the blood, in the absence of any kidney disease, is an indication of the extent of protein destruction taking place as a result of the toxæmia. The fall in chlorides suggests that the chlorides are being used as a protective agent against the toxic body. The alkalosis is probably an incident in the chloride metabolism in which the sodium ion is released due to the utilization of the chloride ion and unites with carbonic acid to form sodium bicarbonate.

If the assumption be correct that the chlorides in intestinal obstruction are used as a protective agent against the toxic body, the administration of sodium chloride is then indicated. In one patient (Case 2), 90 grams of sodium chloride were given subcutaneously during the first 36 hours after admission to the hospital with but 1.8 grams appearing in the urine and without a rise above normal in the blood. This seems to show that the body tissues have utilized this supply of chloride and indicates its need in such conditions.

CONCLUSIONS

1. Definite blood chemical changes are found in acute intestinal obstruction, manifested by a fall in the blood chlorides, often a rise in the carbon dioxide combining power of the plasma and a rise in the non-protein nitrogen.

2. The fall in chlorides is considered the chief factor of this change and indicates that the chlorides may be utilized by the body as a protection against the toxic agent.

3. The administration of sodium chloride in larger doses than that supplied by physiological saline is indicated in acute intestinal obstruction as a means of directly combating the toxæmia.

4. Since an alkalosis is frequently present in intestinal obstruction, alkalies should be administered with caution.

5. We have estimated that in the presence of the toxæmia of intestinal obstruction that sodium chloride as an initial dosage of 1 gram per kilogram of body weight should be administered. The blood and urine chlorides should be closely followed to estimate the subsequent quantity of sodium chloride needed to keep the chlorides at a normal level in the blood.

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RETROPERITONEAL LIPOMA

Brief Summary of the Literature With the Addition of a Case of Our Own

By LOUIS A. GREENSFELDER, M.D., F.A.C.S., Chicago
Senior Attending Surgeon, Michael Reese Hospital
and
RALPH BOERNE BETTMAN, M.D., F.A.C.S., Chicago
Adjunct Attending Surgeon, Michael Reese Hospital; Clinical Assistant in Surgery, Northwestern Medical School

RETROPERITONEAL lipoma is an extremely rare condition. A surprisingly large number of cases, however, have been reported in the literature and the condition has been carefully studied and ably presented by several authors. The case we wish to report emphasizes many points which have already been noted, but we fell this will aid in establishing our knowledge of this disease.

The most careful and thorough article which has appeared lately is the article by A. L. von Wahlendorf. He reviews the literature up to 1921 and has collected 165 cases. He adds one of his own. Wahlendorf does not seem to have been aware of the work of Lecéne, who in 1919 reported 113 cases of solid paranephritic tumors. Many of these were lipomata. Although Wahlendorf has included most of these cases in his review, especially the earlier ones, some, which justly might have been included, have been omitted. Both of these articles contain excellent bibliographies. We have been able to find a few other cases in the literature, most of them published since Wahlendorf's article went to press. Walter Holmes reports one case, Masson and Horgan 12 cases. Hirsch and Wells report the largest tumor so far recorded. These authors also report a case of McConnell which to their minds was really a case of retroperitoneal lipoma instead of a hypernephroma which had undergone fatty degeneration, as McConnell thought. Heppner reported a case. These references plus the references given in the bibliographies appended to the articles of Wahlendorf and Lecéne cover all cases, so far as we know, reported in the literature to date.

Our case in many ways typifies the average case reported in the literature. The condition is more common in the female than the male; 72 per cent as compared to 28 per cent in Wahlendorf's series. It occurs at any age although most of the cases were found between the ages of 40 and 60. Bork and May report a case in a child 1 year old, Masson and Horgan one in a patient 72 years old.

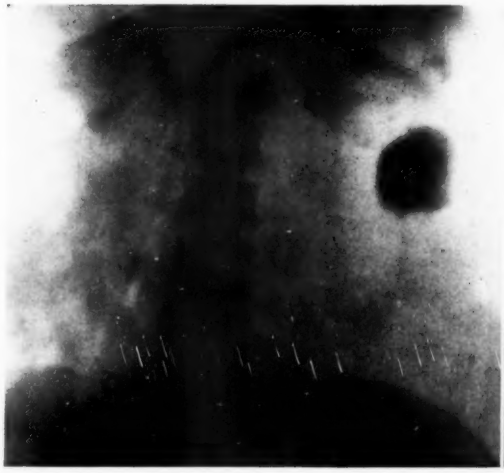

Fig. 1. X-ray plate showing round opaque mass in left side of abdomen. This mass corresponds to the calcified mass later found encapsulated in a tumor.

Fig. 2. X-ray taken 2 hours and 10 minutes after bismuth meal, showing stomach and small intestines filled with bismuth. It is interesting to note that the small intestines lie entirely in the right side of the abdomen. The tumor masses evidently occupy the entire left side. The shadow in the left side (within the mass) corresponds to the shadow seen in Figure 1.

The tumor is usually situated in the abdominal cavity, but it may be in the pelvis—79 per cent and 21 per cent respectively in Wahlendorf's cases. The tumor usually arises from the paranephritic or lumbar fat, but it may arise from the renal capsule, the mesentery, the pararectal and retrorectal fat, as well as from other retroperitoneal sites. It occurs about equally on either side of the abdomen. The type of tumor varies. Wahlendorf found pure lipoma in 46 per cent and mixed forms in 54 per cent of the cases. Of the mixed forms 20 per cent were fibrolipoma, 10 per cent mixolipoma, 10 per cent fibromixolipoma, while the remaining 14 per cent of the 54 per cent were sarcomata. Of Masson and Horgan's series 2 out of 12 cases had undergone sarcomatous degeneration.

The size of the tumors reported varies from very small tumors to tumors of enormous size. They have a tendency to attain tremendous proportions. Hirsch and Wells report the largest on record—the tumor weighing 69 pounds, a liposarcoma, which filled the entire retroperitoneal space. In this case it is interesting to note that although the patient was emaciated to an extreme degree the tumor had been storing up fat.

One of the striking characteristics of retroperitoneal lipomata is the absence of discomfort. Growth in size of the abdomen was the most common, and usually the earliest, symptom. Masson and Horgan sum up the symptomatology of their 12 cases as follows: In 6 cases the presence of the tumor was first noticed by the patient, in 3 the physician discovered the tumor, 6 complained of abdominal pain, 2 pain in the back. In only 1 case was the pain very severe. Six cases complained of food distress, 2 vomited, 5 were constipated, 6 lost in weight. In the case of a degenerating lipoma the symptoms are apt to be acute. The duration of symptoms varies from a few months to many years.

The prognosis is grave. Of 113 cases in Wahlendorf's series, the operative mortality was 25 per cent. This is high because it includes the early cases. Of cases reported since 1910, the operative mortality has been 14 per cent. The figures of Lecéne correspond closely with those of Wahlendorf. Masson and Horgan's mortality was 16 per cent. Injury to the large vessels is the chief danger at operation, as the tumor is apt to surround the large mesenteric vessels, making the dissection extremely difficult.

Fig. 3. Gross section of the tumor taken after having been hardened in formalin. At the lower left-hand corner of the tumor can be seen the calcified masses which constitute the shadow in the X-ray pictures, Figures 1 and 2. This picture shows the large dimensions of the tumor, about 21 centimeters in long diameter.

Recurrences are frequent. Just how frequent is very difficult to say. Of the 113 operative cases reported in Wahlendorf's series, 15 recurrences are noted. Wahlendorf claims that this obviously is too low because among 60 cases listed as "cures" without recurrence 18 were sarcomatous; also of many cases listed as "incomplete removal" only one was noted as having recurred. Lecéne reports recurrences as numerous. In Masson and Horgan's series one case had 3 recurrences, another 1.

The clinical diagnosis is difficult. In our case, we thought a kidney tumor most likely. We confess that the condition of retroperitoneal lipoma did not enter our minds. Had we been as familiar with the literature on this subject then as now we might have considered it.

Retroperitoneal lipoma has been mistaken for almost every possible intra-abdominal condition. Masson and Horgan tabulate their cases to show the pre-operative diagnosis and state: "It is noteworthy that the percentage of error in the clinical diagnosis of retroperitoneal lipoma is very high."

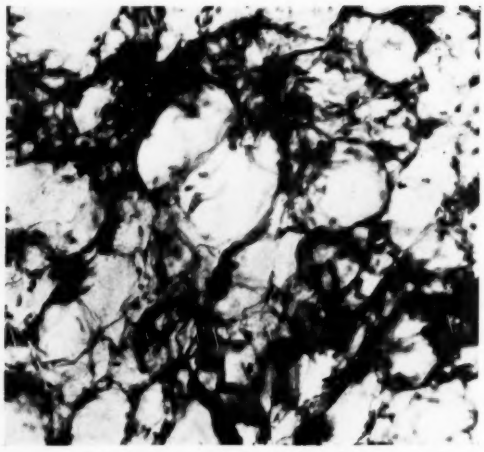

Fig. 4. Photomicrograph of a section of the tumor showing the fairly typical lipomatous character.

Mrs. R. K. (54) entered the hospital July 12, 1921, complaining of swelling of ankles, numbness of left leg, and a lump in the left upper abdomen. For years (20) patient had noticed a lump in the upper right abdominal quadrant which had increased slowly in size and which at no time had caused her any inconvenience. This mass had been examined by numerous physicians who differed as to the diagnosis but concurred in the opinion that no operative interference was indicated. For the last 4 or 5 months patient had noticed that her ankles were swollen at night. The swelling was painless and were it not for the fact that her shoes felt tight in the evening might have passed unnoticed. With the swelling patient had noticed a feeling of numbness. Otherwise she felt well. She had been in perfect health all her life. There had been an occasional headache, at times she had had abdominal discomfort following indiscretion in diet, occasional constipation, but on the whole had been as free from complaints as any average normal individual.

On examination Mrs. R. K. was found to be a well-nourished, healthy-looking individual about 54 years old, lying quietly in bed with no apparent pain or discomfort. Physical examination revealed nothing bearing on the condition except for the abdomen. The extremities were normal, there being at the time of the examination no swelling of the ankles. The contour of the abdomen was normal. There was no tenderness or rigidity. A mass was palpable in the left side reaching from the costal margin down almost to the crest of the ilium and extending from the flank almost to the mid-line. The mass was smooth, regular, apparently slightly movable with respiration, firm but not hard, not tender. Gas-containing intestine seemed to lie over it. The urine was normal. Cystoscopic examination

with ureteral catheterization failed to reveal any abnormality. Tests showed normal urinary function. Blood counts were normal. Hæmoglobin was 85 per cent. X-ray examination showed a small, round, opaque mass about the size of a hen's egg lying on the left side of abdomen about the level of the iliac crests. Except for the fact that the intestines seem to be displaced to the right side of the abdomen an opaque meal and enema revealed nothing pathological. The large mass which was palpable cast no definite shadow. No definite diagnosis could be made, but, inasmuch as the tumor was growing to such a size as to produce pressure symptoms, it was deemed advisable to perform an exploratory laparotomy. Three months later, after a trip to California, the patient re-entered the hospital for operation. Her condition at that time was exactly as on previous admission.

Under ether anæsthesia the abdomen was opened through a left pararectal incision. A large tumor was found which was definitely retroperitoneal. The descending colon was pulled to the right and an incision made to the left of the colon. A firm, unencapsulated mass, the size of a small orange, was easily removed by blunt dissection. Another much larger mass was then shelled out of the retroperitoneal space. This mass was about 6 inches in diameter. There was very little bleeding although the mass extended over to the mid-line and seemed to be grooved by the large mesenteric vessels. These masses were of a lemon yellow color and were definitely composed of fatty tissue. The lower pole of the left kidney was palpated retroperitoneally and seemed free; the kidney itself was not enlarged and was normal on palpation. Careful inspection showed no more tumor tissue. There was no bleeding. The pericolic incision was closed with catgut. The abdominal incision was closed in layers with catgut. The patient left the operating room in good condition. The convalescence was uneventful. And now, 1 year since operation, there are no return symptoms, nor can any tumor mass be palpated.

The report returned from the pathology laboratory by Dr. O. T. Schultz was as follows:

Pathologic diagnosis: Fibrolipoma of retroperitoneal tissue, with degeneration necrosis and calcification.

Gross specimen consists of a large amount of tissue composed of lobulated masses from 4 to 12 centimeters in diameter. These are covered by a thin fibrous capsule. They vary somewhat in consistency, but all are rather soft. On section the 2 largest masses have the appearance of pale yellow fat which is somewhat firmer than normal adipose tissue. A third large mass is pale, firmer, contains less fat, and is centrally calcified in a small area. The smaller masses are in part yellow and fatty, in part paler and more translucent. One separate lobule 4.5 centimeters in diameter is transformed into a completely calcified mass covered by a fibrous capsule. A second lobule 2.5 centimeters in diameter is similarly calcified.

Microscopic. Microscopically the tissue shows as great a variation as it did in the gross. The softer, yellowish nodules are composed chiefly of adipose tissue, whose lobules are small. The paler denser nodules are composed almost entirely of connective tissue. The latter is dense, and in places hyalin, degenerated, with a few nuclei, and poorly vascularized. Other nodules are composed of fibrous and adipose tissues intermingled in varying proportions. There is nowhere anything to suggest malignancy.

In summary we might write that retroperitoneal lipoma are most apt to occur in elderly individuals, and usually in women. The symptoms are vague, varied, swelling of the abdomen being the most constant one. The prognosis is poor. The operative mortality is high, about 15 per cent, due to the likelihood of injuring the large abdominal blood vessels. Recurrences are frequent. The tumor may be a pure lipoma but is apt to be a mixed tumor; sarcomatous degeneration is likely to occur. The tumor may arise from almost any retroperitoneal location but most frequently has its origin in the pararenal fat. Clinical diagnosis is difficult.

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SARCO–CARCINOMA OF THE UTERUS

By R. H. JAFFÉ, M.D., Chicago
From the Department of Pathology of the University of Illinois, College of Medicine and the Uihlein Memorial Laboratory of the Grant Hospital

IN the group of the mixed tumors undoubtedly the most interesting ones are those which show the combination of carcinomatous and sarcomatous tissue. This combination may be due to the growing of a carcinoma and a sarcoma into one another, both of them taking origin in different parts of the same organ. Or the carcinoma as well as the sarcoma may arise from the same place. The name sarco-carcinoma should be used only for this latter type of tumor (von Hausemann).

There are three possibilities to explain the histogenesis of the sarco-carcinomata. First, the carcinoma may have been the primary tumor, the stroma of which changed into a sarcoma. Or the sarcoma may have been followed by the carcinoma. Finally both the tumors may have developed at the same time. Important facts were reported for each of these modes of origin, but in most of the cases it hardly will be possible to decide exactly which of the two tumors was the first one, the carcinomatous and sarcomatous part usually being connected very closely. On account of this close connection of epithelial and mesenchymal formations, doubts have arisen whether in these tumors there is a real combination of sarcoma and carcinoma or whether the sarcomatous character of the tumor is not only stimulated by the cells of the carcinoma taking up mesenchym-like shape (Ewing, Krompecher, Herzog). Every pathologist, no doubt, has experienced how difficult it may sometimes be to decide whether a tumor should be called sarcoma or carcinoma. I recall particularly the melanomata of the skin and the malignant tumors of the hilus of lung formed by small spindle-shaped cells (Marchand, Arnstein, Jaffé and Sternberg). In the primary tumor the distinctly alveolar arrangement of the cells will strengthen the diagnosis of carcinoma. But the diagnosis of spindle-cell sarcoma will sometimes be made, if only a metastasis in the skin has been examined.

Most of the tumors formerly reported as sarco-carinomata are surely pure carcinomata with partly sarcoma-like appearance of the tumor cells. This has been fully discussed in Herxheimer's critical paper and in the summary in Ewing's excellent book. But, on the other hand, there can be no doubt about the existence of a group of tumors, representing a true combination of carcinoma and sarcoma. The proof of this is twofold: the experiences of the experimental tumor pathology and the formation of connective-tissue material in the sarcomatous part.

A considerable number of observations now exist concerning spontaneous, transplantable tumors, most of them being found in mice which have changed their microscopical structure from a medullar or glandular carcinoma into spindle-celled sarcoma during the course of the transplantation (Bashford, Erhlich and Apoland, Murray and Howland, Russel, Woglom). The carcinomatous part finally disappeared. Also in cases of experimental carcinoma produced in mice by painting the skin with tar for a long time the development of sarcoma in a typical carcinomatous ulcer was reported (Deelman). Like the X-ray, tar seems to possess the irritating power of producing both carcinoma and sarcoma and this not only in the same organ (skin) but sometimes even at the same place. But here, too, the possibility that the carcinoma may assume a sarcoma-like appearance must be acknowledged as demonstrated in the report of Bierich.

The elaboration of intercellular material, such as collagen, cartilage, and bone, can only be due to cells derived from mesenchyme. Therefore, if in the sarcoma-like part of a mixed tumor the formation of one of these intercellular substances is to be found, the name sarcoma for this part of the tumor seems to be strengthened (W. H. Woglom). Unless one could assume, as Krompecher does, that under pathological conditions epithelial

cells, losing all their characteristic qualities, may change into connective substances. Nevertheless, a malignant tumor showing all signs of sarcoma can only be called sarcoma.

Tumors that have definitely originated as a result of simultaneous malignant neoplastic growth of epithelial cells and stroma are rare in man. All together about 32 cases have been reported, most of them being found in the uterus, œsophagus, and thyroid gland (Brunn, Herxheimer, Klee, Kleinschmidt, Krompecher, Saltykov, Simmonds, etc.).

The carcinomatous parts of these tumors represented either the type of adenocarcinoma or of squamous-cell carcinoma. There were also some tumors in which adenocarcinoma and squamous-cell carcinoma could be found side by side (Stein, Klee, Saltykov). The columnar cells had been transformed by metaplasia to squamous cells.

The sarcomatous portions were described as round-celled, spindle-celled or giant-celled sarcomata. By reasons mentioned above, I emphasize those cases in which the sarcoma represented higher stages of differentiation. Such are the cases of Saltykov (fibro-myxo-sarcoma, osteo-chondro-myxo-sarcoma), Kaufmann (chondro-sarcoma) and Kleinschmidt (myo-sarcomata).

The tumor to be reported here is interesting, because the early stage of the development of the sarcoma permits its histogenesis to be easily recognized.

Woman, age 35, married, stated that for the last 10 to 12 years she had trouble with ulcers along the generative tract. However, she seemed to be fairly well until about 4 or 5 months ago, when she noted that she was bleeding from the vagina. At first the bleeding was very small in amount, but gradually it became greater in amount and more persistent. Lassitude has been present for a long time. Since the clinical examination proved a tumor of the portio uteri suspicious for carcinoma the uterus was removed (Dr. Zimmerman).

Macroscopical state of the uterus: The uterus is slightly enlarged, its diameters being 8.75, 7.5, 5 centimeters. The corpus is deformed by several spherical, intramural myomata, the largest of which has a diameter of 2.5 centimeters. One and one-fourth centimeters behind the right tubal corner there is a small subserous myoma attached to the uterus only by a narrow pedicle of connective tissue. Almost the entire surface of the portio is changed to an irregular ulcer with uneven base. Coagulated blood covers grayish red and small papillæ. On the right side of the portio a spherical firm nodule, 1 centimeter in diameter, can be noted. The cross section through this nodule shows a whitish, distinctly striped cut surface with small faded reddish areas near to the external surface. The mucosa of the corpus and cervix is smooth and pale.

Fig. 1. Microscopic section showing large spindle cells between carcinomatous alveoli.

The microscopical examination shows that the ulcerated tumor of the portio is made up of cells of different form and size which are arranged in smaller or larger alveoli. The alveoli are often connected and so produce an irregular network. The majority of the cells at the periphery of the alveoli are small. They appear dark because of the large content of chromatin of their oval nuclei. In the central parts the nuclei are larger, and a granular meshwork of chromatin can be recognized on a faintly blue stained ground (hæmatoxylin-stain). Most of the nuclei contain two or three small, but very distinct, nucleoli. Extremely seldom the cells of the center manifest the tendency of forming small and rudimentary horn pearls. In some of the larger alveoli a considerable amount of fat droplets within their cells can be stated. There are in every alveolus an abundant number of mitoses, many of them being atypic, hyperchromatic, asymmetric, or multipolar.

The alveoli are separated by a stroma which shows an exceedingly variable and intricate structure. First there is to be found a very intensive inflammatory reaction. Dense infiltrations composed by lymphocytes, plasma cells, polymorphonuclear leucocytes and a great many eosinophile leucocytes surround the alveoli. Leucocytes often invade the areas of the carcinomatous cells and can

be distinguished between them by their characteristic nuclei. The alveoli seem at times quite disorganized by the breaking in of the inflammatory cells. Other alveoli appear compressed by the mighty infiltrations and their cells have become elongated and spindle shaped.

In some areas an increasing amount of fibroblasts join the round cells and leucocytes. In the deepest and apparently oldest parts of the tumor, the stroma is formed by a very dense and firm connective tissue consisting of fibrillar and partly hyaline intercellular material and of small cells with dark nuclei. In these parts the alveoli of the carcinoma are small and widely separated. Here and there one or two isolated carcinomatous cells showing signs of disintegration may be seen.

In that part of the tumor macroscopically described as a spherical and firm nodule, the microscopical examination discloses an uncommon and very interesting state of the stroma. Large accumulations of inflammatory cells and dense fibrous tissue about the alveoli can also be noted here. But in the fibrous tissue larger and more irregular cells appear. These cells take up spindle shape, they become more and more numerous, while the intercellular material becomes reduced. There is finally an area where the stroma is almost formed only by large spindle cells arranged in fascicles which interlace in various directions (Fig. 1). The spindle cells contain large nuclei with distinct structure of the chromatin, but no nucleoli can be seen. Atypical mitoses are very frequent.

It may be questioned whether these spindle cells are really cells of the mesenchymatous stroma or whether they are cells of the carcinoma changed to spindle cells by the pressure of the surrounding tissue. To answer this question seems to be necessary, because it was observed that the cells of the present carcinoma sometimes become spindle shaped due to the action of the proliferating stroma. Yet we find some characteristics which will enable us to determine that these spindle cells which grow exuberantly are derived from the mesenchyme. I will not insist upon the different form and structure of the cells and their nuclei. It can be admitted that these differences are not in themselves sufficient for a sure decision. I agree therein with Ewing, Herxheimer, Herzog and Krompecher.

But the questionable cells produce collagenous intercellular material. Stained with van Gieson's picric acid and acid fuchsin mixture the spindle cells appear yellowish. Not seldom, however, it can be seen that the peripheral part of the cells takes up a pinkish color and this part of the cell body passes over to faintly reddish, band-like masses between the cells. Sometimes the cells are separated by a more distinctly red meshwork of fibers with which they are inseparably connected.

One other fact determines the bundles of spindle cells as belonging to the stroma. I mean the distribution of the blood vessels. Blood vessels never can be found within the areas of the cells of the carcinoma, even they may appear as spindle cells. The vessels are limited to the stroma and that also in these parts where it is formed by the sarcomatous spindle cells.

By these reasons the present tumor may be considered as a combination of a squamous-cell carcinoma with a spindle-cell fibro-sarcoma. I do not hesitate to call it a sarco-carcinoma.

What may be the genetic relation of the two components of this tumor? R. Meyer suggests that in most of the sarco-carcinomata the carcinoma followed the sarcoma. Other observers (Simmonds, Klee, Stein) consider the carcinoma and sarcoma as having originated at the same time, while Kleinschmidt supposes that the carcinoma produced a sarcomatous reaction of the stroma.

In the present tumor a very strong reaction of the stroma against the invading carcinoma was to be noted. It could further be seen that on one place the proliferation of the mesenchymatous tissue exceeded the limits of the normal representing all characteristics which are considered as significant for malignant tumors of the connective tissue. I believe, therefore, that the carcinoma caused the sarcomatous degeneration of the stroma. But it was not a common stroma which reacted in this atypical way against the irritation by the carcinoma. The tendency for its excessive growth pre-existed and the carcinoma merely enhanced this state. In the portio of this uterus there was the disposition for malignant new formation in both the epithelium and the mesenchyme. The carcinoma became at first manifest and caused at the same time the manifestation of the sarcoma.

Carcinoma and sarcoma grow against each other and in the majority of these tumors the sarcoma will finally prevail owing to its greater power of proliferation (Herxheimer). The metastatic tumors which were found in cases of sarco-carcinoma represented either only sarcomata (Cullen, Forsner, Ivanoff, Stein), or sarcomata and carcinomata (Saltykov). About metastases in our observation nothing is known.

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CONGENITAL FIBULAR DEFECTS

WITH THE REPORT OF A CASE OF BILATERAL CONGENITAL TOTAL ABSENCE OF FIBULÆ

BY JOHN JOSEPH NUTT, M.D., F.A.C.S., NEW YORK

CONGENITAL absence of fibula, partial or complete, is not of itself such a serious condition. Corner mentions five cases between 40 and 47 years of age who had led active lives without any fibula. The lack of an external flange to the tibio-astragalar mortice is more troublesome than the disturbance to the fibular muscles. Usually, however, there are accompanying abnormalities which complicate the mechanics of the leg and foot to such a degree as to make treatment far from simple. There is frequently absence of the fifth, or fourth and fifth toes, together with more or less disturbance in the lower epiphysis of the tibia, the astragalus, calcaneus, and cuboid. A foot is thus presented which seldom lends itself to reconstruction by manipulation or operation. Doubtless, before the advent of X-rays, many cases escaped notice but especially were errors made in judging the entire bone to be absent when some part was present which the X-ray would have revealed. As the condition is usually accompanied by an anterior bowing of the tibia with what is apparently a scar over the convexity, it was thought that intra-uterine compound fracture had taken place, and the classification was therefore frequently erroneous.

Cotton and Chute cite a case as congenital absence of the fibula which was reported by L. Proudfoot in 1846 as follows: "Right foot showed equino valgus. Tibia of same limb seemed to have compound fracture at middle, union slightly salient anteriorly. Cicatrix on skin over point of fracture." Guyot and Charbonnel report: "Cicatricial depressions at the angles of deformation are always present in these cases, due to amniotic pressure."

This cicatricial tissue was examined histologically by Handek, Hoffa and Kirmisson and determined by each to be an atrophic degeneration of the skin rather than a true cicatrix. In many case-histories the presence of the scars is noted, but its absence has been remarked in a number, and only 27 per cent of Schaff's cases showed scars.

Gaenslen supports the view of Braum, expressed in 1886, that these scars are healed pressure sores, emphasizing the fact that "similar scars and also bursæ have been found over the prominent external malleolus in extreme cases of congenital club foot and over the head of prominent subluxated fibula." Furthermore a scar has been reported over the tip of a very sharp and prominent but not defective coccyx in a case of congenital tibial defect. These cases are cited to show that scars have occurred not only apart from bone defects, but if co-existent, remote from them, so that they cannot be brought into etiological relationship. These scars have never been observed over large flat surfaces, as the back or sides of the abdomen, where closer and more intimate contact must be assumed, than over the more

Fig. 1. Showing patient's feet before operation.

freely movable extremities. Moreover, the scars are found with greatest frequency in cases where the angulation is sharp, and are absent, as in Gaenslen's own case, where there is but slight bending.

The consideration of the etiology of this condition is much clarified by ruling out defects of the fibula associated with intrauterine fracture, amputation and other conditions such as pseudo-arthrosis, and limiting our subject to those cases in which the total or partial absence of the fibula is accompanied by interference with the normal development of other bones of the leg or foot, especially the outer two toes. The amniotic theory is usually accepted as correct. Probably the pressure of amniotic bands occurs during the period from the fifth to eighth week of fetal life and whether external traumatism is a causative factor is questionable.

The diagnosis is not difficult. Palpation is usually sufficient. The absence of external malleolus with an equino valgus foot, the absence of one or more toes with their metatarsals, a shortened tibia with an angulation in its lower third and a small mark or pseudo scar over the curve, furnishes a pathognomonic picture. There are cases, however, of fibula defects where the external malleolus is present and no foot deformity exists other than a slight equinus.

The roentgenograph is of great help and will clear up the condition of the epiphyseal cartilage of the tibia and the absence or changes in the tarsal or metatarsal bones.

Treatment in the majority of cases is unsatisfactory. In a typical case the normal bones will not lend themselves to the construction of a foot even approaching the normal. If, however, this can be done, the replacing of an absent external malleolus may be attempted by a bone graft from the tibia, or an ankle brace with a free joint can be adjusted to retain the foot in the proper alignment.

Patient, 9 years of age. Height, 42 inches. Weight, 48½ pounds. Wassermann negative. Urinalysis showed nothing abnormal. Family history failed to reveal any congenital deformities even in the collateral branches.

Examination showed a boy with good general constitution, dwarf-like in appearance and with markedly deformed feet. It was quite evident the shortening was limited to the legs below the knees. In comparison with other children of the same age, with same length femur, the shortening was estimated to be 4½ inches. Measurement of the arms showed no inequality and both were of normal length. Length of legs from the anterior superior spine to the internal malleolus, 17½ inches; the tibiæ were 6½ inches. No fibulæ could be palpated. Over the crest of the marked angulation in the lower half of the tibia there was apparently a scar of ½ an inch in length. There were three toes on each foot. Left foot was in equino-valgus. Movement was greatly restricted at tibio-tarsal joint and absent at the medio-tarsal joint. Right foot was much more deformed. It was plantar flexed at the medio-tarsal, bringing the forefoot to a right angle with the heel and everted so as to face the plantar surface of the foot outward and backward.

The X-rays showed the left foot to have a rudimentary astragalus and united with the os calsis, cuboid and scaphoid so as to form one bone, or the cuboid might be considered as absent. In the right foot the os calsis and scaphoid were united, and the line of the axis of this bone brought into a line almost parallel with the axis of the tibia but extending downward and outward. Both forefeet showed the presence of three toes with accompanying phalanges and metatarsals and only two cuneiform bones.

January 9, 1922. Under an anæsthetic an attempt was made to correct the deformities. Two weeks later he was allowed up in casts. The result of this operation showed no improvement.

The impossibility of reducing the deformities with or without a mobile foot and furthermore the interference with the function of the epiphyseal cartilage made us decide to amputate with the expectation of giving good appearing and functionally useful feet and with restoration of a normal length to the legs.

June 5, 1922. The right foot was amputated by the Syms operation.

June 19, 1922. Same operation on the left foot.

After a month, wooden peg legs were applied. These were made so as to be removable.

December 12, 1922. Artificial feet were applied.

Fig. 2. Roentgenogram before operation.

A study of the literature of this condition reveals a vast number of articles in many of which statements appear of a number of cases seen or culled from the literature without any specific report or reference.

Rivorola quotes the statistics of Vegas in which only one case of absent fibula was noted in 1,336 patients in a children's surgical service. He also gives his own statistics covering the years 1902 to 1913 in a children's surgical service in which he reports 12 cases or one in about 3,000 of various surgical conditions and only one of these is bilateral.

Handek in 1896 published 97 cases which he found recorded and gave six additional cases of his own. Of these 6, 1 was a total absence of the fibula, but the others are of doubtful conditions. He is usually credited with 103 cases but I would reduce this to 98, tabled as follows:

	Cases
Total unilateral absence of fibula	45
Total bilateral absence of fibula	23
Partial unilateral absence	24
Partial bilateral absence	5
One not given	1
	98

Fig. 3. Two views of patient showing artificial feet applied.

Schaff in 1909 presented 6 cases of his own and collected 49 others from the literature; a few of these had been overlooked by Handek, the rest had occurred since Handek's article. Of the 55 there were:

	Cases
Total unilateral absence	28
Total bilateral absence	13
(No further information)	2
Partial unilateral absence	8
Partial bilateral absence	2
No information as to whether they were total or partial	2
Total	55

Handek and Schaff have together reported 153 cases, 36 of which were total bilateral. We give 29 cases overlooked by them and 30 found in the literature since Schaff's article, making the total to date, 213, with the case herewith reported. These are all in chronological order.

CASE 1. Tyrie, C. C. B. Partial unilateral absence; lower two-thirds of fibula. The fibula ended in a point from which a fibrous band could be felt stretching down to and becoming lost in the region of the external malleolus.

CASE 2. Freer, E. L. Boy 7½ years. Left tibia absent and fibula, 6 inches in length only, lay obliquely across the knee below the condyles. Foot attached to external malleolus and turned up against inner side of thigh. Four toes. Amputation. Right tibia normal, fibula rudimentary, extreme valgus of foot, 4 toes. Peronei tendons divided, foot inverted. Fall during pregnancy.

Case 3. Walsham, W. J., and Hughes, W. K. Congenital total unilateral absence.

Case 4. Whitman, R. Unilateral total (?) absence fibula.

Case 5. Tubby, A. H. Complete unilateral absence; intra-uterine fracture of tibia. Fall in fourth month of pregnancy.

Case 6. Steel, A. J. Unilateral complete absence. "No external malleolus was present, at least the fibula could not be felt." A scar two and a half inches long existed in the skin over the lower third of the spine of the tibia.

Case 7. Steele, A. J. Unilateral partial absence.

Case 8. Steele, A. J. Unilateral total absence.

Case 9. Morestin H. Left leg terminated by a stump in lower third. Dissection found no trace of fibula. Right leg, much reduced in size, had no fibula. Three toes. Many other deformities.

Case 10. Delanglade. Bilateral total absence. Double genu valgum. Curvature of tibiæ. Four toes only. Hypospadias. At 1 year absolutely no club foot, perfect functional activity. Walked, ran. Child first seen at 6 months, and mother instructed to manipulate feet.

Cases 11 and 12. Kirmisson, E. Kirmisson reported 2 bilateral cases, 2 right total and 2 partial unilateral.

Handek and Schaff have reported of those 1 bilateral total, 2 right total and 1 partial unilateral, omitting 1 total bilateral and 1 partial unilateral.

Case 13. Cotton, F. J., and Chute, A. L. Complete unilateral absence fibula.

Case 14. Cotton, F. J., and Chute, A. L. Partial unilateral absence fibula.

Case 15. Cotton, F. J., and Chute, A. L. Partial unilateral absence fibula. (No epiphysis.)

Case 16. Roubinovitch, J. At birth the umbilical cord was wound around the lower extremity of the left leg. In cutting this an accidental incision of the skin occurred, which has left a scar. Roentgenograph shows absence of the fibula, a very short tibia, thin and slightly curved.

Case 17. Hendrix. Absence (probably total) of both fibulæ. Each tibiæ showed pronounced anterior curvature, each with a sort of umbilical depression. The Achilles tendons were greatly retracted.

Case 18. Taylor, H. L. Presumably unilateral total absence. No full description of case. Photograph, right leg normal, left shortened 5 inches, 2 toes missing.

Case 19. Piquand. Durin's case (no reference). Unilateral partial absence.

Case 20. Piquand. Phocas, "Lecons cliniques de chirurgie orthopédique." Paris, 1895. Unilateral partial absence.

Case 21. Dubrac, R. Complete absence of one fibula. (Roentgenogram). Adherent scar. Operation.

Case 22. Dubrac, R. Complete absence of one fibula—large scar. (Roentgenogram.)

Case 23. Dubrac, R. Complete absence of one fibula. Roentgenogram shows complete absence of external malleolus and lower third, but a fibrous cord was present in the upper portion. Small nonadherent scar.

Case 24. Dubrac, R. Absence external malleolus (one side). (Roentgenogram.)

Case 25. Dubrac, R. A typical case of absence of fibula in woman 58. The single large bone which formed the skeleton of the leg differed totally from the fibula both in diameter and upper and lower articulations. This is similar to Klaussner's fourteenth observation; Klaussner declared this bone to be the tibia.

Case 26. Dubrac, R. Man 32. Roentgenography showed unilateral partial absence of fibula; complete atrophy of middle portion; the external malleolus was a fragment 4 to 5 centimeters long terminating at the upper extremity in a fine point. The head was normal, but the bone rapidly diminished.

Case 27. Del Greco, E. Complete unilateral absence of fibula.

Case 28. Gray, G. M. (Elderly female.) Unilateral partial absence. No fibula could be palpated from the outside. The fibula was represented by a stout fibrous cord for the greater part of its extent. Toward its lower end it became cone-shaped and hollow, the space being filled up by a mass of spongy bone. At its extremity it presented a disc of dense bone, with a smooth, cartilage-covered facet for articulating separately with the tarsus. At the upper extremity, the fibrous fibula was directly continuous with the external lateral ligaments of the knee joint.

Case 29. Docky, H. Total unilateral absence of fibula. Angulation of tibia, cicatrix, 4 toes; other leg normal except for one missing toe. Roentgenogram. Etiology: Nothing significant except violent abdominal pains at end of second month of pregnancy. The writer raises question of intoxication of the germ.

The following 26 cases were reported since the article by Schaff.

Case 30. Kofman, S. Right leg congenitally absent from knee down. Left leg, total absence of fibula.

Case 31. Anzilotti. Complete absence of fibula (one side) with malformation of tibia, absence of 5th toe and integrity of fibular musculature.

Case 32. Guyot and Charbonnel. Bilateral partial absence of fibula. Roentgenograms showed just a trace, very small and atrophied, of fibulæ at their lower extremity. The tarsal bones were atrophied and deformed, particularly the astragalus. Scars.

Case 33. Dienlafe, L. Total absence of both fibulæ (roentgenograms at 3 and 8 years). There was incurvation of the right tibia; at the age of 3 years, there was an oblique fissure in the angulation; this was no longer present at the eighth year. Operation on both legs. Child can walk and play, etc.

Case 34. Perriol. Total unilateral absence of fibula (roentgenogram). No fifth toe; posterior concavity of tibia; no cicatrix or signs of intra-uterine fracture.

Case 35. Rendu, A. Complete unilateral absence of fibula. At the height of the tibial angulation, there was a deep cutaneous scar, very adherent, from an amniotic band.

Case 36. Le Breton, P. Unilateral total absence of fibula.

Case 37. Le Breton, P. In both cases, absence of lower epiphysis of tibia; bent tibiæ with scars.

Case 38. Klar, M. Unilateral partial absence of fibula. Bone present in upper and lower extremities with about 7 to 8 centimeters lacking in middle.

Case 39. Hesse, Fr. A. Total absence right fibula; atrophy of left fibula. Volkmann's ankle defect, particularly external malleolus.

Case 40. Corner, E. M. Infant with deformity of left leg. Femur and patella normal; leg curved in lower part, 4 toes only present. Situated over convexity of bent tibia was a "scar" slightly adherent to the bone. This "scar" avowedly suggested the previous presence of a compound fracture of the tibia. A roentgenogram of the leg showed curvature of the tibia, absence of fibula, the astragalus and calcaneum represented by one bony cartilaginous mass; a deformity of the cuboid, absence of the fifth toe, with outward deflection of the leg and some talipes vagus.

CASE 41. Rocher, H. L. Complete unilateral absence.

CASE 42. Gaenslen, F. J. Partial absence of right fibula, upper epiphysis not formed, lower small; no scar.

CASE 43. Gaenslen, F. J. Complete absence of fibula, slight angulation of tibia; scar.

CASE 44. Gaenslen, F. J. "Intra-uterine fracture." "Partial defect of both tibia and fibula."

CASE 45. Gaenslen, F. J. Complete absence of one fibula.

CASE 46. Gaenslen, F. J. Apparent complete absence of one fibula.

CASE 47. Gaenslen, F. J. Complete absence of one fibula, tibia bent. Scar.

CASE 48. Albee, F. Boy 5 years. Foot and lower third left leg absent; right fibula entirely absent.

CASE 49. Albee, F. "Only a portion of the lower half of the fibula absent."

CASE 50. Ashhurst, A. P. C. Boy 7. Congenital absence of right foot and congenital malformation of the left. Right knee joint normal, but no right fibula. Left knee joint normal, but no left fibula and outer two toes and corresponding portions of foot absent.

CASE 51. Rivarola, R. Left fibula; total absence. Right fibula; partial absence (upper two-thirds).

CASE 52. Rivarola, R. Unilateral partial absence.

CASE 53. Rivarola, R. Unilateral total absence (also patella). Congenital cicatrix.

CASE 54. Rivarola, R. Infant 4 days. Unilateral total absence to palpation; tibia misformed; 2 last metatarsals and toes missing on both feet.

CASE 55. Rivarola, R. Unilateral total absence. Well-marked skin-fold seen at anterior aspect of leg and on point of greatest concavity of tibial curvature; no cutaneous cicatrix. No missing toes or other deformity.

CASE 56. Rivarola, R. Unilateral total absence. Pronounced tibial curvature; no cicatrix; 4 toes.

CASE 57. Rivarola, R. Right tibia presented anterior protuberance with depressed cicatrix, 1 centimeter wide. Foot in valgus; only 3 toes. Left leg 8 centimeters shorter than right. No cicatrix, but outward rotation in distinct cone formation. Foot atrophied and in talus valgus position, with only 2 united toes. Heel formed by internal malleolus. (No definite statements about fibulæ.)

CASE 58. Rivarola, R. Unilateral total absence; patella missing; all toes present. Congenital shortening of leg exclusively due to imperfect development of tibia; no curvature; foot in equino valgus position.

CASE 59. Rivarola, R. Total unilateral absence; patella and 4 and 5 toes absent. Movements of limb practically entirely preserved.

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SURGERY OF THE SEMINAL VESICLES—INDICATIONS, TECHNIQUE AND RESULTS

Report of 135 Cases

By JOHN H. MORRISSEY, M.D., and FREDERICK W. SMITH, M.D., F.A.C.S., New York
Assistant Surgeons, Brady Foundation, New York City, St. Bartholomew's Hospital; Consulting Surgeons, New Jersey State Hospital

SURGICAL treatment of infections and pathological conditions of the seminal vesicles cannot by any means be called a common procedure. Several workers have been most prominently identified with pioneer exploration in this field in the past 20 years, and as yet there is no unanimity between urologists regarding the questions of treatment and particularly in the value of surgery.

In the light of subsequent knowledge, the technique of the early investigators was considerably inaccurate and their conclusions were sometimes erroneous. We know that in the early technique of vesiculotomy there was some possibility of error as regards results.

Fuller in a résumé of his cases published in 1909, "A Consideration of the Surgery of the Seminal Vesicles," reported in all 700 cases. These had been operated on for symptoms varying from neurasthenia and hysteria to chronic urethral discharge, sexual excitement, pain, rheumatism, and other causes. With the exception of 10 cases of which 7 were tuberculosis, he noted marked improvement and a mortality of but one.

In 1911, Koll reported a series of cases of vesicular disease in which he noted bladder symptoms of varying types, due to inflammatory changes in the vesicles. He called attention to the fact that, owing to the close relationship between the vesicles and the structures at the bladder base, it was easy to understand the symptomatology and urged a greater recognition of this etiology. Operation was not advised, however.

Squier, in 1914 in a careful study of the operative indications, expressed the opinion that the varied symptomatology of vesicular diseases was due to encapsulation by scar tissue—of the entire area, preventing proper emptying or drainage and thereby offering to the blood stream a constant supply of toxins. He had operated on a series of cases the preceding year. At this time an original operative procedure was described which greatly facilitated the exposure of the structures and their treatment surgically—thereby probably accounting largely for the good results reported. The entire procedure was accurately determined and carried out under the control of the eye, thereby differing from the Fuller method which was at best a blind procedure. Indications were summed up under three headings: (1) pus; (2) pain; (3) rheumatism; and the factor of chronicity figured largely in the selection of cases for operation. In cases with relapsing epididymitis, chronic prostatitis, perineal pain, etc., drainage, he thought, was indicated. Other foci having been carefully eliminated, a series of cases operated upon for rheumatic symptoms alone showed universally "immediate cessation or amelioration of the joint symptoms."

After a careful dissection of 100 specimens of pathological vesicles, Barnett called attention to the innumerable blind pouches that composed the mucus-lined interior of the structures and noted the possibility of retention cysts following inflammatory changes with no chance for drainage on account of duct obliteration. He noted further that one of every three cases showed an involvement of the ureter in the form of a stenosis at the point where it is in relation with the vesicle and vas. He stated that, in some cases, dilatation of the distal end of the ureter was already in progress. In his conclusions, he refers to the future of vesiculectomy as an operative field.

In 1913, Hugh H. Young urged that recognition be given vesicle infections as a focus in obscure joint and cardiac conditions as well as in urological affections. He believed the essential process to be an acinous

Fig. 1. Line of incision with central tendon undivided.

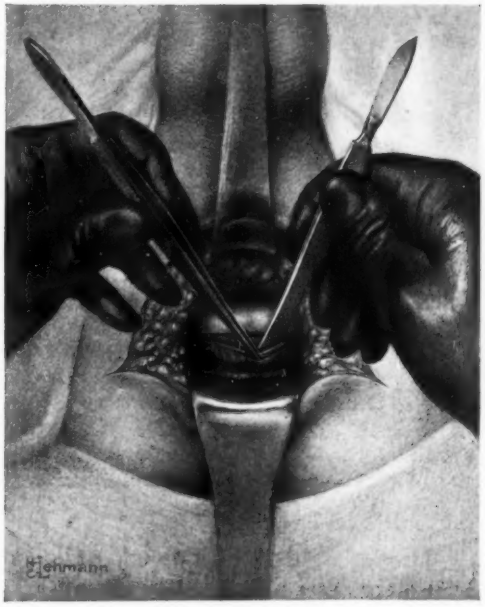

Fig. 2. Exposure of prostate; rectum retracted posteriorly. Method of identifying two layers of prostatic fascia. The deeper layer blends with the intervesicular fascia which covers the vesicles. Recognition of this second layer greatly facilitates the further operative procedure.

or periacinous inflammation within and without and about the vas deferens, and the seminal vesicles. He advised operation with excision and drainage as a radical, safe, and effective means of cure.

Young modified the technique of the Squier operation and combined several steps employed in the perineal operation for removal of the prostate, and it is his operation with several further modifications that we have employed in our work.

In the following year, Barney called attention to the fact that chronic infection of the vesicles decreased the amount of connective tissue locally, and the resulting contraction distorted and prevented a normal drainage. Barney thought that the poor results that he had observed following vesiculectomy were due to the prostate contributing to the infectious and toxic process. His observation was that cases showed not an interrupted convalescence but exarcerbation or infection of joints already quiescent.

Picker reported the study of a number of specimens with the conclusion that only 3 per cent of infected vesicles were able to drain normally, and he found a diversity of anatomical structure in the cases examined.

White, in 1916, made a careful study of the symptomatology, and he concluded that the results of medical and expectant treatment were unsatisfactory. In his article he lays considerable stress on the nervous symptoms, claiming that in 90 per cent of the cases, these were well marked and of long standing, the patients being highly neurotic.

Among other evidences of vesicle infection he stressed hæmospermia and pyospermia, diminution of sex strength, impotence, abdominal and perineal pain, and innumerable bladder symptoms. He believes that operation should be performed for three indications: (1) relief of pain, (2) the evacuation of pus, and (3) for the removal of hard, indurated fibrous vessels of long standing and productive of much discomfort.

Vesiculectomy is the operation of choice, he thinks, in long-standing cases with sclerotic vesicles, whereas vesiculotomy with drainage was found satisfactory in pus cases and the acute catarrhal forms.

In a study of 52 cases, of seminal vesiculitis, Stokes reported interesting conclusions. Eight of the cases required operation. He decided that seminal vesiculotomy was rarely indicated and should be done only where there was an empyemic vesicle with signs of sepsis. He claimed that the pathological condition would return when the wound was healed, and felt that, in all chronic infected vesicles, with a series of chronic symptoms, vasostomy should first be tried, then after consideration, vesiculectomy. He further states that seminal vesiculitis as a clinical entity is exceedingly rare and treatment of the seminal vesicles alone yielded imperfect and incomplete results.

A further comprehensive review of the literature would not be complete without including the work of Cunningham, who reported on a large series of cases at the Long Island Hospital, and who had gratifying results. He made careful analogous studies of the pathology of the vesicles and the roentgenology of the affected joints, and showed the actual changes resulting after the removal of the focus in the vesicles.

It can thus be seen that there is ample evidence and opinion both for and against surgical measures and procedures on the seminal vesicles and the subject can yet be considered as incomplete. We have had opportunity to operate on a large series of cases, and have already reported the pathological findings in a series of cases done on patients where the neurotic symptoms were pronounced.

To this number have been added some 35 cases until the series now comprises over 125 cases in all, embracing types from each group. The classification adopted by White and Cunningham of dividing cases according to their symptoms has been followed, and it would seem that this is an intelligent and comprehensive division. In addition, however, the local findings and condition of the vesicles on examination must be given great consideration.

In the presence of acute symptoms or chronic symptoms, when the vesicles were distended and fluctuant and there was an associated moderate or severe prostatic inflammation and the prostatic secretion contained a large amount of pus, we have considered it justifiable to interfere surgically. In a certain proportion of the cases, it will be noted that the vesicle will not empty readily and this may be taken as evidence of a partial or complete blocking of the lumen of the ejaculatory duct or an encapsulation of fluid within the vesicle. This is the type that can be relieved only by operation.

SUPPURATIVE INFLAMMATION OF THE VESICLES

Inflammation of the vesicles exclusive of tuberculosis may be divided into two types: the acute and chronic. With a view as to when operative interference is indicated, the cases have been classified with reference to symptoms.

1. Those in which the pain is the predominating element with inflammatory changes;
2. Those in which rheumatic symptoms predominate; and
3. Those in which vague local symptoms are pronounced, with an accompanying unexplained neurosis.

Cases presenting vague symptoms such as bladder fullness, a feeling of inability to empty the bladder or a sense of incomplete emptying, vesical tenesmus, burning, etc., without residual urine, urethral discharge, or changes in the prostate which are grossly evident, should all be suspected of chronic vesicular infection. Occasionally, if the vesicles are vigorously massaged and found not to empty on pressure, a careful watch of the temperature chart following this manipulation will reveal a slight fever reaction. In this respect it is analogous to the slight fever following vigorous bimanual examination in the female and utilized as a diagnostic sign by the gynecologist when chronic pelvic inflammatory changes are suspected without the presence of tumor.

Guiteras described a feeling of stiffness in the neck of the bladder after urinating as if the bladder wall could not fully contract,

Fig. 3. Showing method of introducing finger beneath second layer of fascia in order to reach tip of vesicle where enucleation should begin.

and he explains this as due to stiffened, unyielding vesicles which extend out onto the bladder wall like a pair of brackets converging to the vesical neck and adherent to the bladder wall. This explains an interesting point in the progress of vesicular inflammation. Occasionally the process is so acute that it extends upward, and the various layers between the vesicle and bladder are obliterated and there is a coalescence of the entire wall of tissue.

Legueu reports a case where extravasation occurred at the site of the vesicles and extended forward along the usual fascial plane, and it was only in radical incision of the perineum that he noted the opening in the bladder at this point. He cites the possibility of this factor being present in other cases of extravasation, and states that abscess formation in the vesicles with destruction of tissue, together with a firm stricture anteriorly, may account for the extravasation.

The cystoscopic examination reveals a well-defined trigonitis in many cases and occasionally the outline of the distended vesicle can be seen showing through the bladder floor. Injected vessels in an area limited by the outline of the vesicles have occasionally been noted. The cystoscopic findings are confirmatory, however, rather than absolutely diagnostic and at the same time explain the bladder symptoms frequently met with and

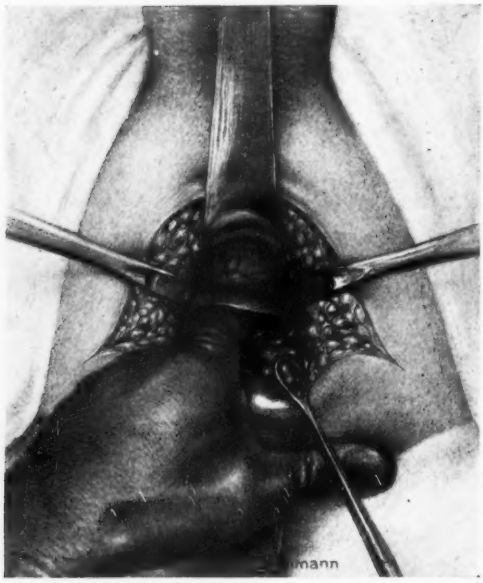

Fig. 4. Enucleation of right vesicle following delivery of left. In most cases the ducts from the vesicles are blocked and they deliver as in the illustration—distended on account of inability to empty. They are tied and divided at their junction with the ampulla.

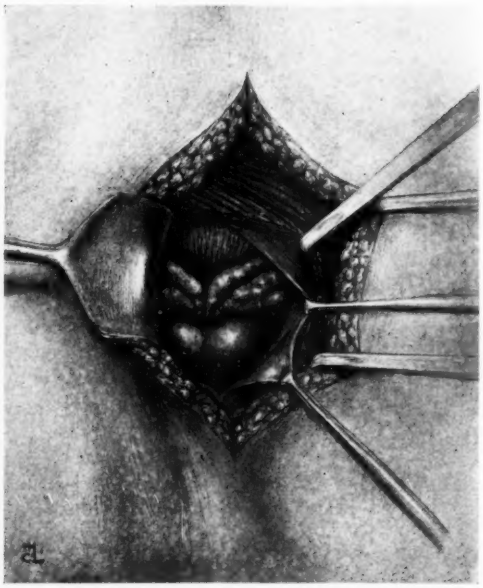

Fig. 5. Exposure obtained in ischiococcygeal method of approach. The levator ani muscles and pelvic fascia are retracted laterally.

already called attention to by numerous investigators.

A typical case history with results from each group is as follows:

TYPE 1

Patient, J. M., age 25, married; three children living and well. Contracted gonorrhœa extramaritally 1 year before, and discharge persisted for 4 months despite all treatment; after 2 months he developed an acute prostatitis with urinary retention. He was admitted to Bellevue Hospital where he remained for 2 weeks. Condition was relieved by hot rectal irrigations and catheterization during the first few days. He returned to work after 1 month and 2 weeks later developed an acute epididymitis. He was readmitted to Bellevue Hospital and treated for 2 weeks without operation. The condition subsided and patient returned to work.

One month later he developed epididymitis on the opposite side with beginning joint pains. He went to private doctor who referred him to New York Hospital. Physical examination showed acute epididymitis on right side, swollen nodular epididymis on left side; general joint pains without local changes; however, bleeding from rectum which was apparently due to a congestion of the rectal mucosa above the prostate and vesicles and not hæmorrhoids. Rectal examination showed prostate swollen, boggy, and moderately tender. Vesicles were enormously distended and fluctuant and would not empty on pressure.

Operation—vesiculectomy. The vesicles were found acutely inflamed and enlarged and left side attached to the bladder base by a firm perivesiculitis which made removal extremely difficult. Both vesicles were removed without rupturing.

Operative convalescence was uneventful; patient was out of bed 5 days after operation. Epididymitis subsided within 4 days, the joint pains disappeared 24 hours after operation. The wound discharged moderately for 11 days. Culture of pus showed colon bacillus; probably a contamination from fæces.

TYPE 2

Emanuel E., referred by Doctor S. H. Meuer, admitted to hospital with chronic urethral discharge and acute gonorrhœal rheumatism. Discharge contained gonococci. The infection was of 6 weeks' duration and joint pains had been present for preceding 3 days. Moderate posterior urethritis was present with marked changes in prostate and particularly in vesicles, which were swollen and distended. Vesicles emptied partially on pressure and the secretion was composed almost entirely of pus.

Patient treated with vaccine for 2 weeks without results and vesiculotomy then done. Operation was uneventful. The vesicles were exposed in the usual manner and freely incised. Vesicle on left side contained pus which was cultured and reported as staphylococcus aureus. Wound healed well. Operative convalescence was unmarked. Patient complained of muscle tenderness for a short time afterward. Temperature remained on normal level and he has been free from symptoms since that time. Roentgenograms showed no joint changes.

TYPE 3—with Psychosis

J. H. P., married; age 32; gonorrhœa in youth with urethral discharge for usual period and symptoms apparently of posterior urethritis. Patient was married at age of 19 and had two children who are living and well. He developed an acute psychosis in 1913 which had been preceded by spells of nervousness which made it impossible for him to hold a job. He was admitted to the St. Lawrence State Hospital, New York, with a diagnosis of dementia præcox; discharged from hospital June, 1915. He enlisted in the army and was discharged on account of nervous symptoms and readmitted to hospital. No details are given until 1918 when he was found with an acute orchitis, a urethral discharge and an active psychosis. He was unable to give any data concerning himself, and possessed various hallucinations and mental confusion. Wassermann examination of both blood and spinal fluid was negative. No evidence of syphilis or paresis was found. Rectal examination showed a moderate grade of prostatitis with large, distended vesicles, easily twice normal size. Vesiculectomy was done under general anæsthesia. Within 5 weeks patient showed a marked return to normal condition and left the hospital within 10 weeks. Reports from the family state that he is perfectly well and better than he has been for years. He is now employed as a railroad telegraph operator and has no abnormal mental symptoms or neurosis of any sort.

A review of the cases studied shows a similarity in histories to those given above. In all cases investigated a rather remarkable subsidence of symptoms and the consistency with which this is maintained must surely be of import.

PATHOLOGY

Pathological examination of the vesicles removed showed a moderate similarity. Cultures made from the secretions from the vesicles showed varying types of organism. Staphylococcus aureus, staphylococcus albus, bacillus lactus aerogenes, bacillus pyocyaneus, and numerous types of bacillus are noted in the cultural findings. Sectional examination of the specimens yield a variety of findings.

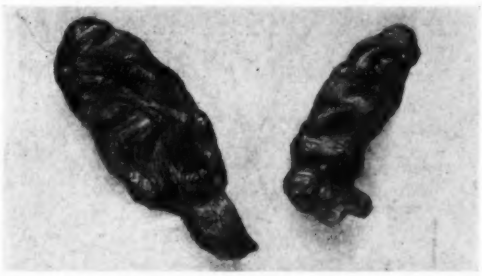

Fig. 6. Types of vesicles removed at operation. Actual size.

When the inflammatory process has extended to the ejaculatory ducts and obliterated the lumen, the vesicles can be usually removed intact. The vesicles are usually two to three times normal size and covered by a firm, fibrous capsule with obvious inflammatory changes. On section the cavities are seen in some cases to coalesce and in others more than one-half the vesicle may be a common cavity, destruction of the interstitial tissues having taken place. Other specimens show an occlusion of the spaces by the development of scar tissue and occasionally numerous small cavities containing a brown inspissated material. Smears made from these show epithelial débris, pus and various types of staphylococcus and sometimes colon bacilli in pure culture.

Following removal of the vesicles there is a marked change in the urethritis and the epididymitis when the latter is present. The discharge usually disappears or changes its character and the epididymitis subsides without the slow rate of absorption generally noted in these cases not operative.

The technique herein described for the operative procedure on the vesicles is, in the main, a combination of the methods devised by Young and Squier, although we feel that our technique contains a number of new features and conservative modifications which contribute largely to the safety of the operation, and are effective in diminishing unfavorable after-results and at the same time aid in a better exposure of the operative field. It is difficult to use the so-called exaggerated lithotomy position without a Young table, and in lieu of this the patient should be

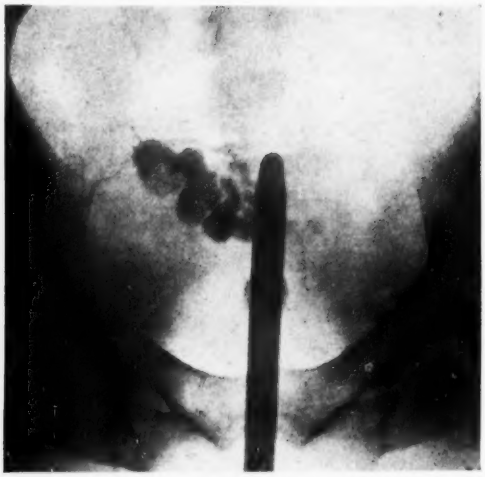

Fig. 7. Chronic discharge; occasional pains; prostate boggy. Fluid contains large amount of pus. Right vesicle tender and distended. Vesiculogram shows a distended, enlarged vesicle without obliteration, however, of intercanalicular areas. Vesicle apparently drains poorly. The tortuous outline of the vas can be made out as it winds around the tip of the vesicle down to the scrotum. The position of the adjacent ureter can be estimated and makes it possible to conceive how extensive perivesiculitis may involve the ureter and produce symptoms in that structure.

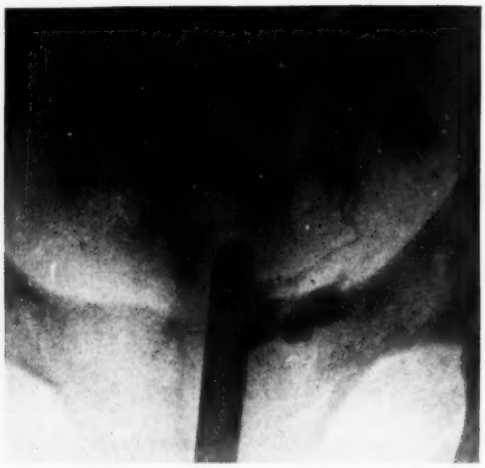

Fig. 8. Vesicle normal in size and appearance, holding the usual amount of fluid. Right side will take scarcely any sodium iodide. Left side fully injected. Outline of vas demonstrable.

brought well forward on the ordinary table and the sacrum elevated from the plane of the table and the buttocks brought out over the edge. This in a way brings the perineum almost parallel with the floor—a great advantage in operative procedure in this field.

A curved incision is then made starting from the ischial tuberosities and continuing through a point which is just superficial to the termination of the bulbous urethra. This point can be determined by palpation of the perineum on a sound which has previously been placed within the urethra. The central portion of the incision should be carried to a depth of at least 1 centimeter. This measure is an important one inasmuch as it provides for better healing of the central portion of the skin flap. In a large series of cases we have failed to obtain a sloughing of the triangular portion at the end as is often seen when an inverted V incision is made. Retraction of the skin flap exposes the sight of the central perineal tendon, and this is divided sharply after blunt dissection of the lateral fossæ on either side. At this point it is important to proceed carefully and retain all the fibers of the bulb in the upper portion of the wound. The thin fibrous line of the central tendon as it converges toward the bulbo-membranous junction can be plainly made out. This obviates a lot of annoying bleeding from the vascular bulb.

The sounds should then be removed from the bladder and the Young seminal vesicle tractor inserted. Traction on this pushes the prostate forward and elevates the apex. By careful sponge dissection, after having previously introduced the finger in the rectum, it is possible to strip away from the apex of the prostate, the well-defined attachments of the recto-urethralic muscle. It is at this point that this muscle becomes prominent and here that one should guard against the danger of injury to the rectum. In observation on numerous operations where the rectum has been injured, we have noted that apprehension regarding the rectum is usually felt prior to this site. It is here, however, that the rectum and prostate are in close apposition and the greatest danger of injury exists.

Gentle tension on the flap with one finger in the rectum then puts these fibers on the stretch, and they can be divided with the

Fig. 9. Showing well-defined abscess of right vesicle. Normal vesicle on left. Outline of vas as it transverses vesicle plainly seen. Tortuous course of vas due to adhesion between vesicle and vas, inflammatory in type.

Fig. 10. Moderate degree of inflammation in the vesicle; note area between vas and vesicle interpreted as limitation of inflammatory process, not involving vas. Outline of the vas plainly seen and course indicated by arrows.

scissors close to their insertion in the urethra. When the rectum has been separated, more than half of the anterior surface of the prostate, the remainder can usually be accomplished by gauze dissection.

The free edges of the levator ani at this point come into view and they can be gently lifted from the posterior surface of the prostate and separation continued by hooking the finger around the free edge of the muscle and further detaching it, after which it can be retracted from the wound.

The posterior surface of the prostate now comes in view, and this should be cleansed of a few adherent fibers of muscle tissue, etc., which have remained from the removal of the rectal wall. This is best accomplished by the handle of a knife and then comes into view the well-defined capsule of Denonvilliers, distinguished by its glistening white color. The prostate is then retracted firmly into the wound and an incision made transversely, at a point just behind the middle axis of the gland. Numerous engorged blood vessels, the latter the result of the vesicular infection, usually can be noted in the tissues, and the incision can be usually varied to avoid these. If sectioned, they give rise to troublesome bleeding. It is at this point that care should be taken to recognize the existence of a special fascial plane covering the vesicles, and after division of the first layer of the fascia, a second layer should be identified and stripped back, in order to reach the vesicles. The tip of the index finger is then inserted anterior to the fascia and along the posterior surface of the prostate and extending outward, and the vesicles can be palpated. Pressure on the organ will sometimes expel a moderate quantity of secretion through the urethra. At any rate the degree of resistance noted is an aid in determining the amount of trauma that can be utilized in removing it. Enucleation is then begun at the tip of the vesicles, and, if carefully performed, the tip will become free. Numerous adhesions are noted to the bladder base, but these can be broken through without difficulty, and further adhesions between the vas, which at this point is directed internally toward the ampulla, are likewise separated. A gauze sponge on a holder, if introduced into the post-prostatic space is often of assistance in drawing the entire structure forward, and the further separation can be completed under guidance of the eye.

Fig. 11. Vesiculogram of case presenting no symptom, chronic prostatitis, hypertrophy of veramontanum, and chronic a. m. discharge. Outline of vesicle well demonstrated. Note adhesion between vas and vesicle at tip of bladder.

Fig. 12. Showing obliterating type of seminal vesiculitis, where the vesicle has probably been caught in the mesh of adhesion and inflammatory changes, involving likewise the vas. The vesicle can be noted as extending out on the base of the bladder, where it gives a certain amount of fixation with bladder symptoms, due to interference with the action of the trigone. The course of the vas is indicated by arrows.

(Acknowledgment is made to Doctor W. R. Delzell for the use of several of these roentgenograms.)

In vesiculotomy, incision is made in the vesicle at the point where it joins the ampulla and numerous incisions along the axis of the organ. In vesiculectomy the vesicle is crushed at this point and then excised. We have not noted the necessity of ligation although it is not an unwise measure. It is wise to caution regarding the presence of this secondary layer of fascia. In some operative procedures it has been observed that the prostate has been incised too deeply, and when the finger is inserted posterior to the prostate, the vesicles cannot be felt because they have been forced down beneath the level of the finger, together with their fascial coverings.

The prostate is then incised liberally, drainage tubes or wicks inserted at the site of excision or incision, and the prostatic capsule sutured in two places. The sound is then withdrawn from the urethra, and a loose suture placed in the edges of the levator ani muscle and this drawn over the prostate, and the central tendon remitted. No further sutures are taken excepting in the skin which is closed with interrupted silkworm gut, and the tube brought out on each side of the central portion of the wound.

In no case have we noted any severe postoperative complications. There has been no acute retention, and in one case moderate bleeding which was due to incomplete checking of hæmorrhage. If the levator ani muscle is cut instead of retracted and bluntly separated from the posterior prostatic surface, it adds a series of difficulties to the procedure. In the first place, the internal pubic artery branches in this area and the nerve supply is extremely rich, giving rise to immediate or subsequent symptoms. Secondly, it is difficult to control hæmorrhage on account of the position of the muscle. In no case have we noted any severe shock. The patients are allowed to get up on the eighth or ninth day. The sutures are removed in the usual time and the operative care is along general lines.

RESULTS

We will not go into a detailed description of results in individual cases. The histories in the foregoing text furnish good examples

of the results that we have generally had. This does not apply to the mental cases, however, where we have noted about 20 per cent of cures. In the last analysis, we cannot be certain that the infectious focus here was entirely in the vesicles, although in each case the examination showed a large amount of pathology present with definite evidences of infection.

In the pus and pain group, with complicating epididymitis and prostatic abscess, an immediate relief from the pain may be obtained with a more rapid subsidence of the epididymitis and prostatitis than under any form of expectant treatment. If there is a moderate urethral discharge, this will generally be found to be reduced considerably, and in some cases disappear entirely. The prostate generally subsides rapidly from its acute inflammatory condition, and returns to normal size.

In the rheumatic group the results are not observed as quickly. The pain from the joints disappears and usually gives way to vague muscle pains which disappear later. It there are joint changes with periosteal involvement, this can be noted to disappear with a subsequent absorption and increased freedom of joint movement, preceded by earlier cessation of local symptoms, such as pain, redness, and swelling. Cunningham's article on this subject gives an excellent detailed account of the immediate results in gonorrhœal arthritis with accompanying photograph showing resulting joint changes.

In the neurotic cases, including only those types in which the vesiculitis has been determined as the cause of a neurosis apart from disturbed mentality, the results are not so good. We have had relatively few of these cases and the return to normal is not so rapid. The patients worry less, however, about their condition, are reassured by the fact that something has been done for them and can usually find less cause and subjective symptoms to complain of. If these cases are followed carefully, however, it will be noted that there is a gradual improved state of mind and less inclination to worry and concentrate on their condition. Numerous observers have pointed out the tardiness of results in this class and curiously it represents the largest number in whom operation might be indicated.

One disagreeable and questionable complication of a seminal vesiculectomy is the occurrence of sterility following the operation. To be sure if the ampulla has been torn away and the connection with the ejaculatory ducts severed, no spermatozoa will reach the posterior urethra. However, in many cases the ducts are already obliterated and the seminal discharge is without testicular constituents. Other operators have noted a return, however, to normal potency within a 6 months' period, and a variety of conditions regarding sterility. We frankly have not taken occasion to examine for the presence of spermatozoa. We have, however, made careful observation regarding the power of erection and the presence of desire, and we have noted these as early as the first week after operation and on the average within 6 weeks or 2 months. This in our minds removes one rather effective barrier to the further practice of the procedure.

SUMMARY

1. Inflammation of the seminal vesicles is a well-defined and recognized surgical condition occurring usually as a sequel to previous infections of the genito-urinary tract.

2. This condition can be relieved surgically by either drainage or extirpation of the vesicles.

3. Operations on the vesicles combine all difficulties of perineal prostatic surgery and a well-established technique must be employed properly to meet indications for operation. Procedures aiming to drain vesicles through skin incisions, punctures, etc., are ineffective and results reported following inaccurate technique cannot be taken into account.

4. Figures and results in a large series of cases with bacteriological findings and improvement noted in a large proportion of cases justify the establishment of the operation and a more frequent use as a surgical procedure in selected cases.

METASTATIC HYPERNEPHROMA

With Special Reference to Bone Metastasis

By ALEXANDER GIBSON, F.R.C.S., Winnipeg, Manitoba, and J. C. BLOODGOOD, M.D., F.A.C.S., Baltimore

THIS member of the numerous family of the neoplasms is quite one of the most interesting. It is a comparative newcomer, having been introduced to the pathological world in 1884 by Grawitz as *struma lipomatodes aberrata renis*. In 1898, the shorter, more convenient, name of hypernephroma was applied by Birch-Hirschfeld, a name which has persisted and is likely to persist in spite of the fact that it perpetuates what is in many cases a "terminological inexactitude."

EXTRA-RENAL HYPERNEPHROMATA

The great majority of hypernephromata are primary in the substance of the kidney, although they may develop in other regions. Thus it is said that they may exist as primary tumors in the liver. Adami and McCrae state: "A few cases are on record of included adrenal tissue (in the liver) and of tumors, hypernephroma or mesothelioma, originating from the same." Rolleston, in referring to carcinomatous growths in the liver, says: "Schmorl and other writers have established the fact that accessory suprarenal bodies may occur in the liver. The development of a malignant disease in the liver from an included accessory suprarenal body or rest is analogous to the well-known malignant renal tumors arising in suprarenal rests." Stoerk, writing in 1908 in criticism of Grawitz's theory of the origin of hypernephromata, asks the question: "Why, in the face of the legion of adrenal rests found in the liver is there not a single case of hypernephroma of the liver established?" According to Rolleston, Pepere, in 1902, "has given an elaborate account of a primary malignant tumor of the left lobe of the liver arising in a suprarenal rest, which appears to be the first recorded case of its kind." Ewing refers to Pepere's hypernephroma as "clearly an hepatic adenoma." According to Ewing, Schmorl "described a small, yellowish tumor in this region presenting the structure of adrenal cortical adenoma. Larger malignant tumors probably of the same nature are recorded by Vecchi and Noyes." A case is recorded by Chiari of a pelvic tumor which, microscopically, had the structure of a hypernephroma. Operation for removal of this tumor was followed by recurrence and death of the patient. A complete postmortem examination demonstrated that "the tumor was not secondary to a growth in the kidney, suprarenal, or any other abdominal or pelvic organ." (Quoted by Wright.) "The gross and microscopical structure (of Chiari's tumor) was rather typical of adrenal carcinoma." (Ewing.)

A uterine tumor recorded by Eastwood showed typical hypernephroma structure on microscopic examination. This patient lived for some years after operation without hæmaturia or other evidence of the presence of a kidney tumor. Wright states: "Secondary deposits do not usually occur before evidence exists of the primary growth in the kidney." This, however, is by no means an invariable rule, and it is quite possible that this particular instance was a secondary growth.

French reported a case which he described as a hypernephroma arising in the suprarenal quite unconnected with the kidney. In the opinion of Glynn and Wright "the section is not characteristic of hypernephroma."

Glynn, who has studied very extensively the extrarenal hypernephromata, states that they have been recorded as primary tumors in "localities where accessory suprarenals occur, such as the liver, the retroperitoneal tissue, the pancreas, the broad ligament, and even in the ovary and the testicle." In regard to ovarian hypernephromata he states: "It is now generally admitted that ovarian hypernephromata have a closer resemblance to lutein formations than to suprarenal cortex." He is even doubtful if a single case of true ovarian hypernephroma has been recorded. In his opinion many of these growths are luteal. The obvious conclusion is that the micro-

Fig. 1.

Fig. 2.

Figs. 1 and 2. 27929. Bone tumor.—16—Pistory. J.C.B. 10550. Roentgenograms showing lesion in tibia.

Fig. 3.

Fig. 3. 27929. Bone tumor.—16—Pistory. J.C.B. 11550. Gross specimen.

scopic features of hypernephroma are sufficiently variable to make the diagnosis by no means easy.

Rather interesting is the fact established by Glynn and Wilson that tumors of the cortex of the suprarenal, usually referred to as suprarenal hypernephromata, do not correspond to the Grawitz tumor. Wilson records three cases from the Mayo Clinic, and states quite emphatically: "Their cellular structure could not by any possibility be mistaken for any of the pictures found in our series of renal tumors."

Clinically it is found that tumors of the suprarenal cortex frequently induce abnormalities of sex and strength. Renal hypernephromata never, under any circumstances, produce these changes.

A remarkable case of hypernephroma occurring between the folds of the falciform ligament of the liver was recorded by Starr. Among the tumor cells were a few cords of liver cells. The pathological report stated: "The general appearance of the tumor under the microscope more nearly approaches that of a hypernephroma than any other type, but the resemblance is not absolute."

What is the ratio of hypernephromata to all tumors? Wright states that of 10,500 patients at the London Cancer Hospital during 15 years, only 6 showed the presence of hyper-

Fig. 4 (at left). 29461. Bone tumor.—10—J.C.B. 11364. Roentgenogram showing central lesion of humerus after healing of a fracture.

Fig. 5. 29461. Bone tumor.—10—Reprint No. 107. Roentgenogram taken some months after Figure 4 was taken. It shows beginning destruction of bone shell.

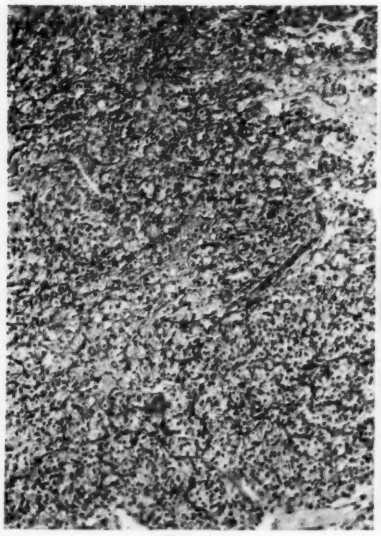

Fig. 7.

Fig. 6.

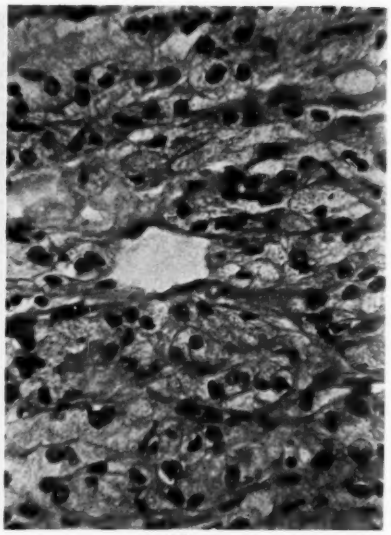

Fig. 8.

Fig. 6. 29461. Bone tumor.—10—J.C.B. 11364. Chambers. Specimen showing tumor occupying bone shell of humerus.

Fig. 7. 29461. Bone tumor.—10—Chambers. J.C.B. 11364. Low power photomicrograph.

Fig. 8. 29461. Bone tumor.—10—Chambers. J.C.B. 11364. High power photomicrograph.

nephroma. This would suggest that the Grawitz tumor is a comparatively rare lesion.

Of kidney tumors, the hypernephroma is much the most frequent. Jocelyn Swan states that they constitute 75 to 80 per cent of all kidney tumors. Pleschner collected 504 cases of which 268 were hypernephroma, 67.4 per cent. Lindstroem, during 43 years, saw 40 malignant tumors of the kidney. Of these 28 were hypernephromata, i.e., 70 per cent. Hyman collected 443 kidney tumors of which 287 were hypernephroma, i.e., 65 per cent. The Mount Sinai Hospital showed 36 hypernephromata out of 38 kidney tumors, almost 95 per cent. Of 92 renal tumors occurring in the Mayo Clinic and recorded by Wilson, 68, i.e., 78 per cent, were hypernephromata.

As regards the age at which these tumors occur, they are for the most part present in late and middle life. Of 28 cases referred to by Hyman, 21 occurred between 40 and 60. One occurred before the age of 10. Scudder re-

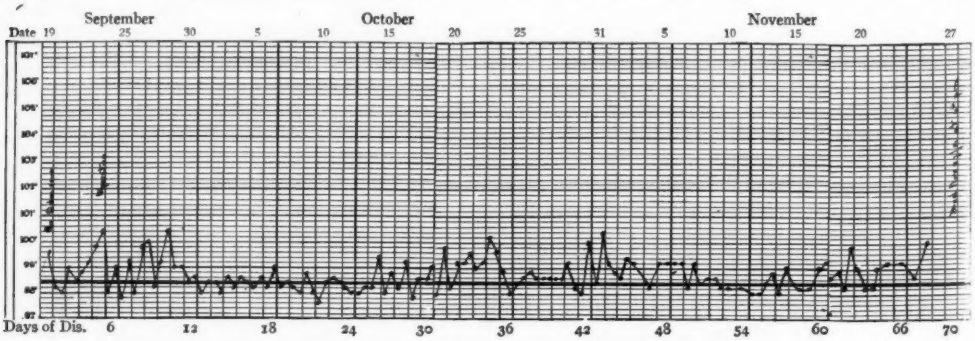

Fig. 9. Temperature chart, case of C.S., temperature being taken at 8 a.m and 4 p.m.

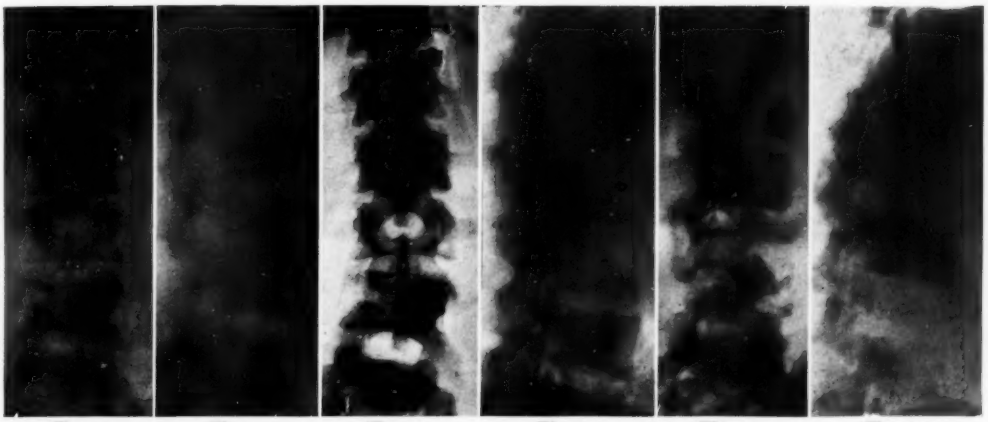

Fig. 10. Fig. 11. Fig. 12. Fig. 13. Fig. 14. Fig. 15.

Fig. 10. September 7, 1921. Lumbosacral region. Anteroposterior view shows slight excavation at right of body of fourth lumbar. Increased density is seen in second lumbar body. There are nodular masses in right and left sacro-iliac regions.

Fig. 11. September 7, 1921. Lumbar spine. Lateral view shows nothing abnormal.

Fig. 12. September 19, 1921. Anteroposterior view shows marked excavation of right side of body of fourth lumbar. Right transverse process detached. Increased density of second lumbar body. Oblique approximation of third to fourth lumbar.

Fig. 13. September 19, 1921. Lumbar region. Lateral view. Note increased density of second lumbar body.

Fig. 14. October 29, 1921. Anteroposterior view shows first lumbar body much crushed and rarefied; second lumbar body apparently denser than normal; third, fourth and fifth lumbar bodies are mere "ghosts" of vertebræ. Sacrum shows deposits in upper part with destruction of right sacro-iliac joint.

Fig. 15. October 29, 1921. Lateral shows first lumbar body, a crushed outline; second lumbar body apparently dense; third lumbar body represented by a few flakes of bone; fourth and fifth, vague outlines.

corded a case where the first indication of tumor was a spontaneous fracture of the left femur at the age of 75.

What is the frequency of metastasis in cases of hypernephroma? This is a difficult question to answer, inasmuch as many case records are incomplete, and many cases with Grawitz tumors of the kidney remain unrecognized as such, a fair number of such tumors being discovered incidentally postmortem. Further, in the light of experience one may say that no record of these cases is complete which does not include roentgenographic examination of the whole skeleton.

The original tumor seems to be variable as regards its malignancy. Thus Ohlmacher describes two cases "in which the tumors attained considerable size, were well encapsulated, had no infiltrating tendencies, and did not give rise to metastatic formations."

A highly malignant case is recorded by Le Count, and the history of the present writer's case is sufficiently convincing evidence that this tumor is among the most malignant of neoplasms. Wright, in his article, refers to 19 specimens of hypernephroma in 13 of which there were "complete clinical histories," yet not one case of bone metastasis is referred to. In Lindstroem's report the abstract makes no mention of bone metastasis. Hyman's account gives no details of osseous involvement in his cases. Scudder, on the other hand, in reporting 10 cases from the Massachusetts General Hospital, records 4 cases which showed bone metastases. After examination of the literature up to date (1906), he concludes that only 15 authentic cases of bone metastasis in hypernephroma were described.

On the other hand it is generally stated that hypernephroma is definitely a tumor which has bone as a "tissue of predilection" for metastasis, a predilection shared with uterine, breast, thyroid, and prostatic carcinoma. Adami quotes Leuzinger as authority for the statement that in uterine cancer, osseous metastases occurred to the extent of 2.3 to 3.5 per cent, mammary 14 per cent, and 20 to 25

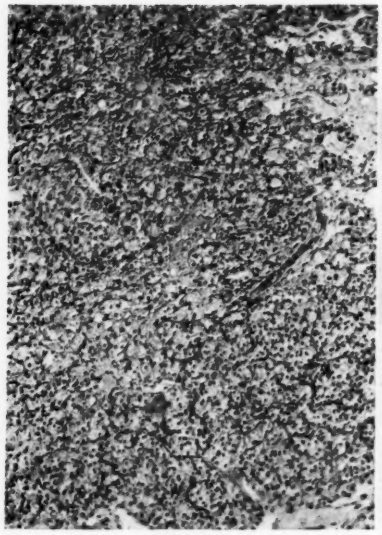

Fig. 7.

Fig. 6.

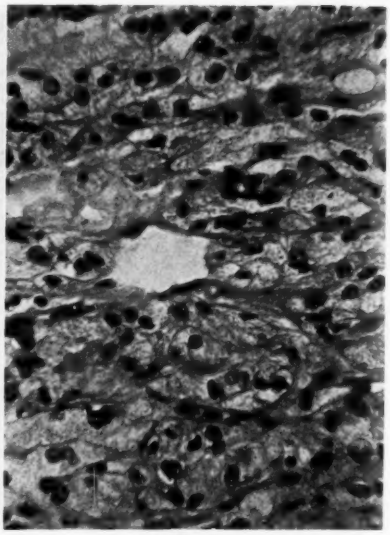

Fig. 8.

Fig. 6. 29461. Bone tumor.—10—J.C.B. 11364. Chambers. Specimen showing tumor occupying bone shell of humerus.

Fig. 7. 29461. Bone tumor.—10—Chambers. J.C.B. 11364. Low power photomicrograph.

Fig. 8. 29461. Bone tumor.—10—Chambers. J.C.B. 11364. High power photomicrograph.

nephroma. This would suggest that the Grawitz tumor is a comparatively rare lesion.

Of kidney tumors, the hypernephroma is much the most frequent. Jocelyn Swan states that they constitute 75 to 80 per cent of all kidney tumors. Pleschner collected 504 cases of which 268 were hypernephroma, 67.4 per cent. Lindstroem, during 43 years, saw 40 malignant tumors of the kidney. Of these 28 were hypernephromata, i.e., 70 per cent. Hyman collected 443 kidney tumors of which 287 were hypernephroma, i.e., 65 per cent. The Mount Sinai Hospital showed 36 hypernephromata out of 38 kidney tumors, almost 95 per cent. Of 92 renal tumors occurring in the Mayo Clinic and recorded by Wilson, 68, i.e., 78 per cent, were hypernephromata.

As regards the age at which these tumors occur, they are for the most part present in late and middle life. Of 28 cases referred to by Hyman, 21 occurred between 40 and 60. One occurred before the age of 10. Scudder re-

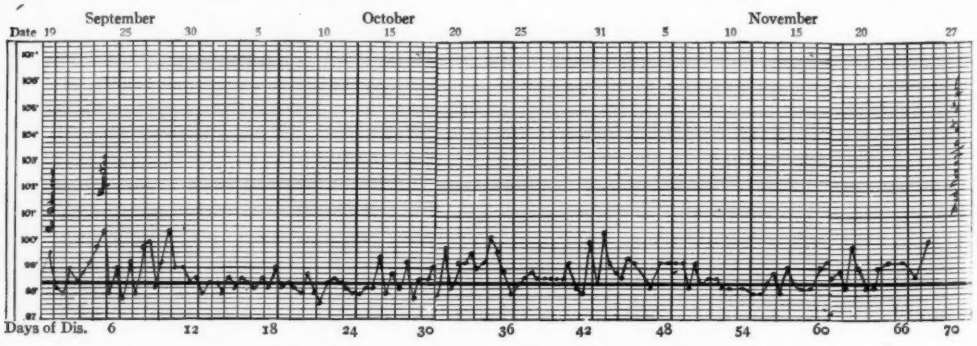

Fig. 9. Temperature chart, case of C.S., temperature being taken at 8 a.m and 4 p.m.

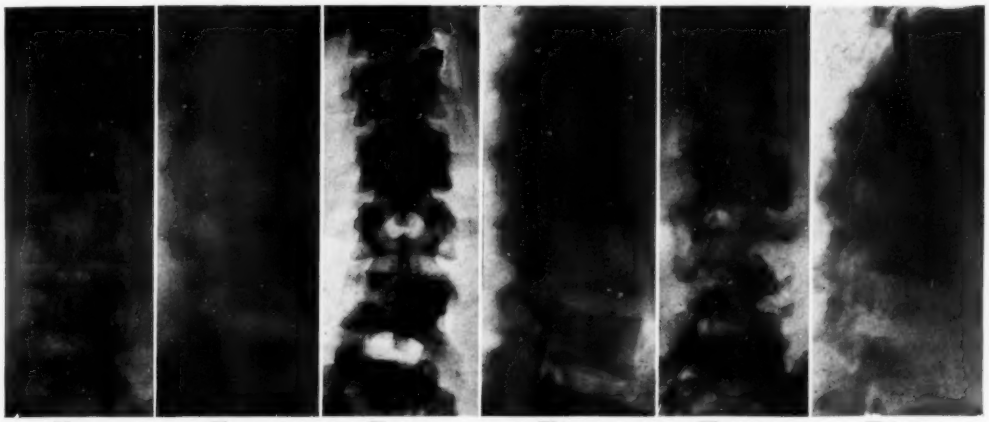

Fig. 10. Fig. 11. Fig. 12. Fig. 13. Fig. 14. Fig. 15.

Fig. 10. September 7, 1921. Lumbosacral region. Anteroposterior view shows slight excavation at right of body of fourth lumbar. Increased density is seen in second lumbar body. There are nodular masses in right and left sacro-iliac regions.

Fig. 11. September 7, 1921. Lumbar spine. Lateral view shows nothing abnormal.

Fig. 12. September 19, 1921. Anteroposterior view shows marked excavation of right side of body of fourth lumbar. Right transverse process detached. Increased density of second lumbar body. Oblique approximation of third to fourth lumbar.

Fig. 13. September 19, 1921. Lumbar region. Lateral view. Note increased density of second lumbar body.

Fig. 14. October 29, 1921. Anteroposterior view shows first lumbar body much crushed and rarefied; second lumbar body apparently denser than normal; third, fourth and fifth lumbar bodies are mere "ghosts" of vertebræ. Sacrum shows deposits in upper part with destruction of right sacro-iliac joint.

Fig. 15. October 29, 1921. Lateral shows first lumbar body, a crushed outline; second lumbar body apparently dense; third lumbar body represented by a few flakes of bone; fourth and fifth, vague outlines.

corded a case where the first indication of tumor was a spontaneous fracture of the left femur at the age of 75.

What is the frequency of metastasis in cases of hypernephroma? This is a difficult question to answer, inasmuch as many case records are incomplete, and many cases with Grawitz tumors of the kidney remain unrecognized as such, a fair number of such tumors being discovered incidentally postmortem. Further, in the light of experience one may say that no record of these cases is complete which does not include roentgenographic examination of the whole skeleton.

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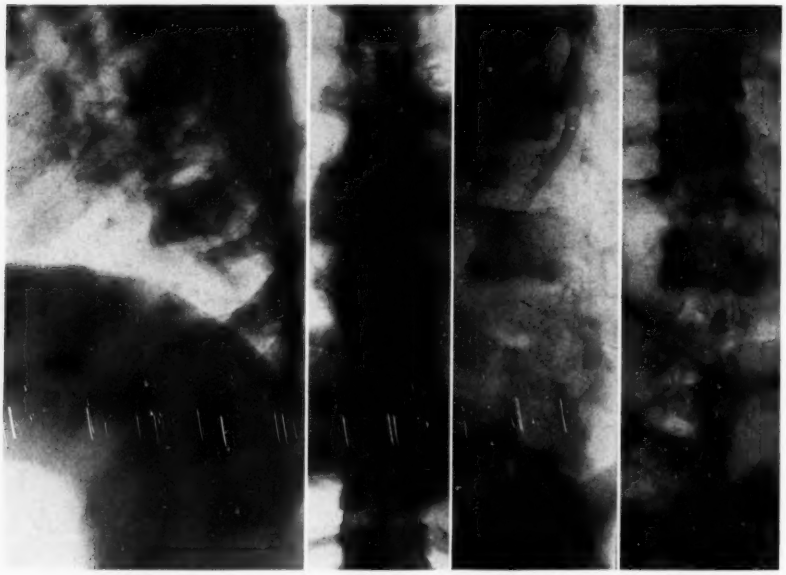

Fig. 16. Fig. 17. Fig. 18. Fig. 19.

Fig. 16. November 27, 1921. Thorax. Lateral view shows indefinite shadows at bases of lungs.

Fig. 17. November 27, 1921. Anteroposterior view of thoracic spine. Metastatic deposit in body of second thoracic vertebra.

Fig. 18. November 27, 1921. Lateral view of lumbar vertebræ. Body of second lumbar is still showing.

Fig. 19. November 27, 1921. Lumbar spine. Wreck of second lumbar is sole survivor of lumbar series.

per cent in thyroid. No figures are mentioned for prostatic cancer or hypernephroma. Kaufmann calculated that about 70 per cent of prostatic carcinomata cause skeletal metastases as compared with 37 per cent for thyroid carcinoma (Limacher) and 14 per cent for mammary cancer. Of 16 cases with skeletal metastases, Kaufmann found more or less osteoplastic tendency in 14 and from the literature he collected 20 cases with extensive growth of bone. Doubtless also cases are met and dealt with as primary bone tumors when the metastasis happens to be solitary, and even when multiple and submitted to microscopic examination, its characteristics as hypernephroma may not be recognized in the absence of urinary findings suggestive of kidney involvement (White). The metastases of hypernephroma, however, are by no means confined to bone. A very interesting and instructive case is recorded by Chance.

The patient, male, age 40, seen in October, 1905, complained of obscuration of sight in the left eye, of 1 month duration. "Beneath the skin of the thorax were several nodular enlargements; in the left groin was a large bubo. Arising from the middle pillar of the iris of the left eye and on the horizontal meridian was a spherical tumor mottled gray in color and approximately 4 millimeters in diameter." A wide iridectomy was performed. The tumor was described as a "perithelial sarcoma." In February, 1906, the eye was enucleated, and the bubo in the left groin removed. The microscopic diagnosis was "small round-celled sarcoma in which are signs of melanotic changes." In April, as an emergency, the abdomen was opened for a double intussusception of the ileum caused by nodules of new-growth. The abdominal viscera were studded with new-growths. Death occurred in May, 1906, after a period of extremely rapid emaciation. Autopsy disclosed "on inner surface of the intestine many tumors varying from 1 to 2 millimeters in size. In the mesentery were a number of enlarged glands and tumor nodules ranging up to 1 centimeter in diameter. None of the abdominal organs contained these tumors except the left kidney. In the envelope of this kidney are 9 or 10 small tumors, the largest about 1 centimeter

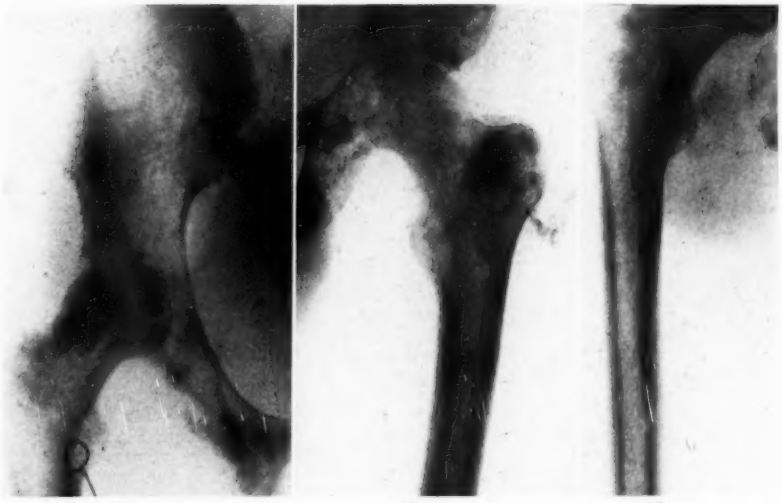

Fig. 20. Fig. 21. Fig. 22.

Fig. 20. November 27, 1921. Pelvis. Shows destruction of greater part of right ischium. Whole pelvis riddled both sides.
Fig. 21. November 27, 1921. Left femur and pelvis. Nothing below lesser trochanter.
Fig. 22. November 27, 1921. Right shaft of femur. Nothing below great trochanter.

in diameter. . . . . At the lower pole of the kidney and protruding from it, is a rounded tumor about 3 to 4 centimeters in diameter. At the upper end of the pelvis in the substance of the kidney is a smaller mass resembling the larger one." The suprarenals were not affected. There were no nodules in the lungs or heart. Microscopic report was that "the general appearance corresponds with that of a hypernephroma—the alveolar arrangement suggesting the zona fasciculata of the suprarenal." The general conclusion was that the "primary tumor was in the left kidney. Secondary metastases were conveyed by the blood, although the deposits in the mesentery might have been conveyed there by the lymph stream as well as by the blood."

This case is of considerable interest as illustrating the difficulty in interpretation of microscopic findings, a difficulty which will be dealt with more fully later.

Chance refers also to a case published in 1899 by Schlipp as an epithelial tumor of the ciliary body. "Schlipp presumed that he was dealing with an unusual form of endothelioma, but studying his paper in the light of my own case, I am convinced that the tumor he described was a hypernephroma. The patient was a young girl."

In Scudder's series of cases, two are of interest from the point of view of metastasis.

In one, a male aged 75, who fell and fractured his left thigh, a firm, hard, tender mass was observed, attached to the roof of the left orbit. There were many nodules over the body, "one ulcerating mass over the right sternomastoid, and another over the right scapula." No tumor was felt in the abdomen. The urine was normal. At autopsy the report was, "hypernephroma of the right adrenal." Metastases were present in the retroperitoneal tissue, in the intestines, the lungs, liver, pleura, myocardium, brain, subcutaneous tissue in various regions, left orbit and left femur.

A second case, a male aged 33, had observed for 6 years a pimple on the pinna of the right ear. Three years previously it had been cauterized but recurred, and grew rapidly. Abdominal and urinary examination was negative. When seen in January, 1904, he presented "the right ear lobe and cartilage changed to a foul sloughing and bleeding mass. Enlarged glands were present on the right side of the neck." The ear was removed and a dissection of the right side of the neck was performed. Microscopic report was, "a lobular growth of large round cells with little intercellular substance. Diagnosis: round-celled sarcoma." In May, 1904, he was readmitted to hospital. The wounds of the ear and neck had healed. He had lost 30 pounds in the preceding 3 weeks. In June, 1904, he died. Complete autopsy showed "hypernephroma with metastases in intestines, stomach, great omentum, mesocolon, retroperitoneal tissue, pancreas, peritoneum, right groin, right shoulder joint (upper end of right humerus), subcutaneous tissues of the trunk, and brain."

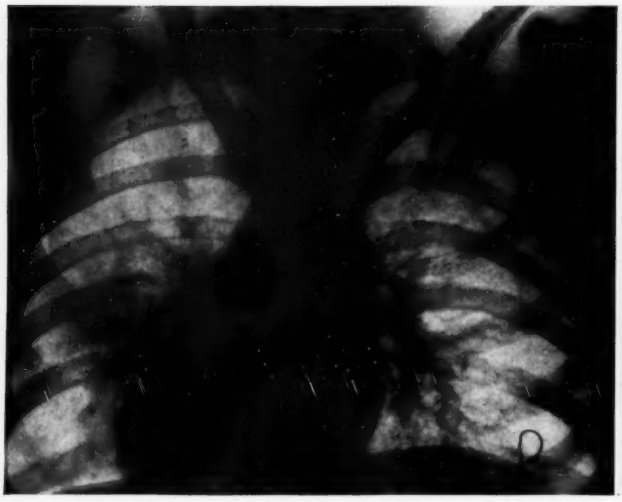

Fig. 23. November 27, 1921. Thorax and lungs. Anteroposterior view shows shadows suggestive of metastases. Really pneumonic consolidation.

Fig. 26. November 27, 1921. Right shoulder and humerus. Ribs, head and shaft of humerus.

In this case record, one point of interest is the long duration of the growth in the pinna with apparently low grade of malignancy.

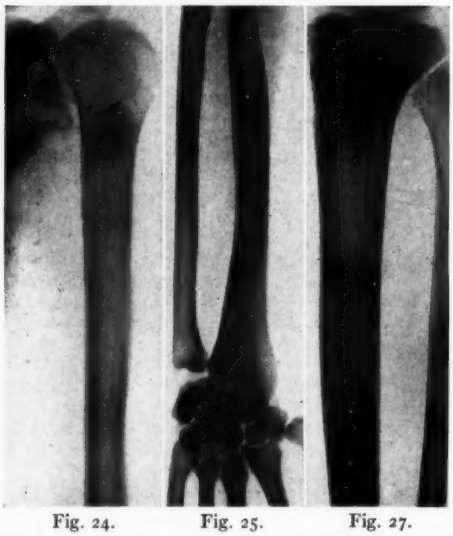

Fig. 24. Fig. 25. Fig. 27.

Fig. 24. November 27, 1921. Left shoulder. Deposits in scapula and surgical neck of left humerus.

Fig. 25. November 27, 1921. Hands and forearms. Nothing below elbow.

Fig. 27. November 27, 1921. Below knees, nothing.

Interesting also, though far from unusual, is the fact that, for a very long time, the metastasis, not the primary growth, was the only indication of the real lesion. Further is the fact that when an increase in malignancy did occur, the progress was extremely rapid. This fact also has been frequently noted. In this case also the difficulty of diagnosis from a microscopic section of the secondary growth is apparent. Sarcoma, the cells being grouped in alveoli, is a common report on metastatic hypernephroma.

Other situations in which secondary growths have been recorded are the base of the tongue (Coenen), the left ventricle of the heart (Batzdorff), the nasal cavities (Storath). Channing and Knowlton describe a case of "metastatic adrenal tumors in the left mid-frontal and ascending frontal convolutions." There is apparently no tissue or locality of the body which is not susceptible of being the seat of secondary deposit. The general opinion, however, is that expressed by Lilienthal: "In the experience of the writer, by far the commonest location of the metastases is in the bones, and especially in the flat bones." Exception might be taken to the last phrase.

OSSEOUS METASTASES

The bone metastasis may be single or multiple. It may be the first indication of the presence of the tumor. A certain number of them are revealed by spontaneous fracture. Thus, Bevan relates the case of a child who, while playing at school, felt something snap in the hip. X-ray showed fracture of the upper end of the femur (right). The child died later, almost the whole skeleton being extensively involved.

In some cases pulsation is a pronounced feature of the bony involvement. Eshner describes a case involving the sternum where the condition was mistaken for an aneurysm of the aorta.

The patient, a woman aged 60, presented a tumor of the manubrium sterni yielding evident pulsation synchronous with the heart and having an expansile character. At autopsy was found "over the manubrium sterni a small lemon-sized tumor of soft consistency which on incision exhibited a grayish color. This was found to involve the entire manubrium and the cartilage of the first and second ribs at their junction with the sternum. The right kidney contained at its lower pole, close to the pelvis, a new-growth 4 to 5 centimeters in dimensions, the uterus at its fundus contained two small chestnut-sized growths. On histological examination the growths in the kidney, lung, uterus, and sternum exhibited the structure of hypernephroma."

White describes a case of multiple pulsating tumors of bone, the growths occurring in the os calcis, the tibia, and the femur. Amputation was performed through the middle of the thigh.

The pathological report was that "the essential part of the tumor consists of masses of cells arranged as solid acini and bounded by delicate capillary vessels. In parts the structure suggests an epithelial growth; other parts suggest a malignant, vascular tumor. A fuller study of the less altered and apparently freely growing areas leads one to the view that it is a sarcomatous formation corresponding to the usual description of 'alveolar sarcoma.'" In spite of the lack of references to abdominal tumor or hæmaturia, the *tout ensemble* of this case is very suggestive of metastatic hypernephroma.

When incised, the osseous metatasis shows the characteristics of a soft, highly vascular tumor; "soft, yellowish material, not unlike a gumma" (Warren Low); "soft, highly vascular, plum-colored growth studded with sulphur-colored nodules" (Nitch); "the tumor is light red in color, mottled with darker red areas of hæmorrhage and has a delicate white reticulum throughout." Evidently the bright yellow areas so characteristic of the primary renal tumor, are not always reproduced in the secondary growth. The tendency to hæmorrhage and necrosis is usually well marked.

Fig. 28. Skull and upper cervical spine shows no deposits in skull; destruction of second cervical vertebra.

As regards the X-ray findings, these may be summed up as resembling those of a central sarcoma of the bone. There is never any production of new bone; the cortex may be expanded, there is usually rarefaction of bone in the neighborhood, and the metastatic shadow tends to be circular in outline. There are no roentgenographic findings which differentiate hypernephroma from any other form of skeletal carcinomatous metastasis. Risley states that metastasis occurs probably by centrifugal spread along the lymphatics of the deep fascia in most cases. While this is true for malignant breast conditions, it is almost equally certainly incorrect for hypernephroma. He

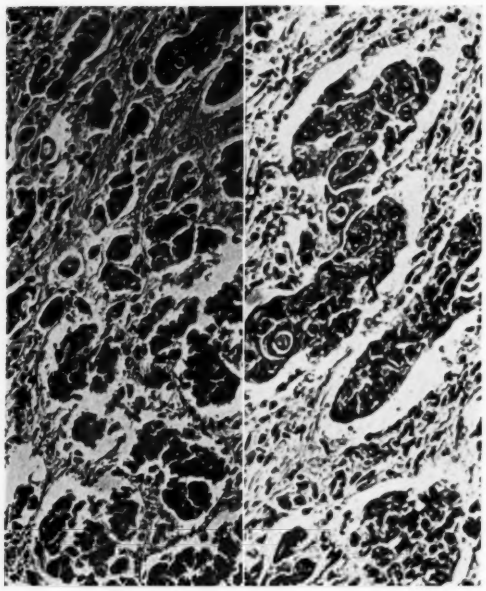

Fig. 29 (at left). Section of tumor tissue, low power.
Fig. 30. Section of tumor tissue, high power.

further states that bone metastases occur almost entirely proximal to the elbow and knee-joints. This occurred in our own case but is not invariable (White, Pool). As regards the method of metastasis to bone, this is probably in the great majority of cases by blood stream rather than by lymph channels. Hypernephromata have a notorious tendency to grow into the veins, cases being recorded where the tumor growth has extended along the renal vein to the inferior vena cava, and even up to the right heart. The liver is a fairly common site for metastatic growths and it is supposed that dissemination occurs by retrograde embolism along the portal vein from the inferior vena cava. MacCallum does not agree with this view and holds that the tumor cells are implanted in the liver after traversing the pulmonary and systemic circulations. In face of the frequency of vascular involvement, it is surprising that the development of a bone metastasis may be delayed. Thus Clairmont describes a case in which death occurred from metastasis in the chest 10 years after operation on the primary tumor. A patient of Albrecht's died 7 years after nephrectomy. Ewing attributes this occasional slow development of the metastasis to phlebitis which blocks the progress of the tumor cells. Fischer reported metastases 6 years and 9 months after nephrectomy; Kroenlein 6 years and 11 years afterward (Trotter). It is of interest and importance that the bony metastasis may be the sole metastasis (Albrecht, Scudder). It would seem at first sight to follow from the vascular dissemination of the tumor that metastatic deposits in the limb bones would be found nearest the entrance of the nutrient arteries. This is not always the case. They are frequently found near the extremities of the bones. This is probably due to the fact that malignant cells in the blood stream tend to fall out of the blood current and settle in the tissues where the caliber of the vessels is smallest, and where the flow is most retarded, as occurs in invasion by organisms in cases of osteomyelitis. These conditions are more probable at the extremities of the bones than in the shaft.

Lymphatic dissemination undoubtedly occurs in some cases. Le Count's patient showed involvement of the inguinal glands; a case recorded by Bierring and Albert, a child aged 5, showed marked involvement of the retroperitoneal glands. The distribution of secondary growths in the case described in this paper suggests lymphatic rather than hæmic dissemination.

Implantation directly on to peritoneal surface is another method of spread, and theoretically, at least, the lower urinary passages might be "infected" by cells from the kidney (Bierring and Albert).

Microscopic characters of the osseous metastases reproduce more or less the characteristics of the primary growth. While in many cases the cells are definitely epithelial in character, in very many others they resemble much more the undifferentiated connective-tissue cells so that they are more frequently described as sarcomatous than carcinomatous. They are often arranged in distinct alveoli; hence the concise report of "alveolar sarcoma" so frequently given. There is usually a small amount of intercellular substance; large-sized cells and mitotic figures are com-

mon. Adami states: "On careful study we can make out the transition from the purely adenomatous to the alveolar sarcomatous areas; and from these areas we may pass to regions of purely sarcomatous type, round or even blunt spindle-celled. The picture is an extraordinary one, wholly at variance with the older views of the 'sanctity' of sarcomatous and carcinomatous properties. Here, absolutely without any manner of doubt a tumor shows transition from sarcomatous to carcinomatous characteristics." It is chiefly on this account that Adami describes these tumors as mesotheliomata.

In reviewing the literature, one is struck with the confusion that exists regarding the primary tumors. Many writers accept without question Grawitz's hypothesis as to these tumors. This probably accounts for some reports of tumors being found in the adrenals when the actual tumor may have been in the upper pole of the kidney. The question at once suggests itself, can suprarenal tumors—not Grawitz's tumors—form bony metastases? On this point, Ewing states: "The frequency of bone metastases in tumors of supposed adrenal origin has long been emphasized, but in most of the reported cases the tumor arose in the kidney and the exact nature was not fully determined. In cases of fully verified adrenal carcinoma bone metastases are infrequent. They occurred in three of Winkler's 10 cases. In 48 cases of various malignant adrenal tumors collected by Hartman and Lecene bone metastases were demonstrated in only 1, while the liver was involved in 23; lungs, 9; pre-aortic nodes, in 8; peritoneum, 5; stomach, pancreas, heart and brain occasionally." It is much to be desired that a distinction should be clearly drawn between "renal hypernephroma" and "suprarenal hypernephroma."

According to Ewing there would seem to be at least three classes of tumors which are at present subject to the diagnosis of hypernephroma:

1. Adenocarcinoma of the adrenal cortex;
2. Hypernephroma arising in the kidney from adrenal rests;
3. Renal adenocarcinoma, papillary or alveolar, arising in the kidney from kidney cells.

In the adrenal adenocarcinomata, bone metastases are infrequent; in the true hypernephromata not very frequent; much the most frequent in the renal adenocarcinomata. Another form referred to by Ewing is a "diffuse infiltrating carcinoma of the kidney, the organ being much enlarged but not greatly deformed, which probably originates as papillary carcinoma of the pelvis. Metastasis was observed in Kischensky's case in the femur."

It is worth while to mention at this point the neuroblastomatous tumor arising as a neoplasm in the medulla of the suprarenal gland, and giving metastases in various parts of the body, mainly in the orbit and cranial bones. These tumors, first described by Robert Hutchison in 1907, occur in childhood, and are not likely to be confused with hypernephroma. They are essentially derivatives of sympathetic nerve tissue. The proptosis which is a fairly constant feature in recorded cases should suggest the diagnosis in a very young subject.

The dispute as to the derivation and character of hypernephromata will probably be pursued by the pathologists for some time to come. Up to the present, the variations in opinion, though always interesting, are irreconcilable with the idea that "hypernephroma" is a single pathological entity. Consideration of the divergent views is outside the scope of this paper.

Dr. J. C. Bloodgood of Baltimore has very kindly furnished a summary of all cases of hypernephroma that have come under his notice during the last 16 years.

SUMMARY OF METASTATIC TUMORS TO BONE FROM HYPERNEPHROMA—SURGICAL PATHOLOGICAL LABORATORY, JOHNS HOPKINS HOSPITAL

Total number of cases 8. From July, 1906, J. C. B. 1415, to December, 1922, Path. No. 31887.

The total number of bone lesions is about 1,000.

Brief summary: J. C. B. 1415, July, 1906, Dr. W. G. Clark, of New York, reports a metastatic hypernephroma of the head of tibia. No tissue received.

Path. No. 6299, February, 1906, autopsy Johns Hopkins Hosp. 2534. White male, age 52, had sciatic pain in left side for 18 months. He had been confined to bed 6 weeks, and had been using crutches on account of pain in leg 15 months. Tumors in

scalp had been present 1 year. Autopsy showed hypernephroma with metastasis to sternum, femur, and rib. The metastatic tumor in the femur shelled out. The bone shell was almost completely destroyed. On incising the tumor much blood was found. The section resembles the tumor in the kidney. Restudy of sections to date shows that the tumor was cystic and the cysts are lined by cells not unlike the hypernephroma.

Path. No. 6930. This case is reported by Scudder in the *Annals of Surgery* for December, 1906, xliv, 851. The tumor occupied the upper end of humerus. The bone shell was expanded and very thin, and the sections were typical of a hypernephroma. My original tissue and sections have been lost. This patient was operated upon by Scudder in September, 1905. Amputation of shoulder girdle type was done. No note that the kidney tumor was removed. Scudder wrote me, 1909, 4 years later, that the patient was living. Sometime later the patient died. Details not given. This case is, therefore, interesting because of the long life after removal of the metastatic tumor.

Path. No. 27929. April 16, 1921, Joseph Pistory. Material sent by Dr. Walter G. Stern, Cleveland, Ohio. Central tumor upper end of tibia with partial destruction of bone shell to the inner side. Treatment: amputation February 26, 1921. Microscopic sections, Bloodgood: hypernephroma. Result: Death December 13, 1921, 10 months. Before death there was evidence of metastasis to the vertebræ. Patient was a male, age 29, Italian. No symptoms referred to the kidney. He had had pain in tibia 8 months. Figs. 1 and 2 are roentgenograms of the lesion of the tibia. Figure 3 shows the gross specimen. This case was diagnosed large round-cell sarcoma. We have no proof that it was a metastatic hypernephroma excepting the sections and the evidence of other bone metastasis before death.

Path. No. 29397. December, 1921. Material sent by Dr. Alexander Gibson. Sections very suggestive of hypernephroma. Fully reported in this paper.

Path. No. 29461. Patient of Dr. W. H. Bachman, McKeesport, Pennsylvania. Reported to Dr. Bloodgood April 3, 1922. Published by Bloodgood, *Minnesota Medicine*, 1922, v, 604, Fig. 4. Figure 4 is the first roentgenogram, showing the central lesion of the humerus after the healing of a fracture. Figure 5, some months later, shows beginning destruction of the bone shell. Figure 6, the tumor occupying the bone shell of the humerus. Figure 7, microscopic, low power, and Figure 8, microscopic, high power. It is interesting to note that the day this section was studied we had a section from a primary hypernephroma of the kidney from another individual, and it was practically impossible to distinguish one from the other. The roentgenogram (Fig. 4), of this case is rather typical of the hypernephroma. The fine dark lines give the light area a spongy appearance, as if the roentgenogram had been taken through a screen. Clinical note: W. F., 65. Fracture of humerus. Roentgenogram 12 weeks later (Fig. 4). At this time X-ray examination of skeleton showed no other bone lesion. No Bence-Jones bodies. No evidence of kidney tumor. Three months later second X-ray examination (Fig. 5), shows destruction of the bone shell. Patient suffers great pain in the arm. Urine contains Bence-Jones bodies. X-ray examination of skeleton is negative. Considered multiple myeloma. The patient became bed-ridden with pain. April 15, 1922, amputation was done because of pain. Now the microscopic section shows a hypernephroma. Further result not ascertained.

Path. No. 30631. Johns Hopkins Hospital, June 17, 1922. Metastasis in frontal bone. Through exploratory incision a piece of bone was excised and microscopical examination showed metastatic hypernephroma. The X-ray examination showed destruction of the left frontal bone. The metastatic tumor rested on the dura. No positive evidence of a kidney tumor was present, but before the patient left the hospital there was a palpable tumor in the right kidney with hæmaturia.

Path. No. 31887. December, 1922. Sections sent by Dr. Schade, Toledo, Ohio, without data except metastatic bone tumor, which Dr. Schade correctly diagnosed hypernephroma.

The following case of multiple tumors of bone came under my care:

C. S., student, aged 20, was admitted to Winnipeg General Hospital on September 6, 1921, complaining of pain in the lumbosacral region radiating along the inner aspect of both thighs; also of numbness along the inner aspect of both thighs.

Previous illnesses. Tonsils and adenoids removed in 1911; appendix abscess in 1916. In May, 1921, he was operated on for recurrent dislocation of the left shoulder, a flap being transplanted from the posterior border of the deltoid, through the quadrilateral space to the coracoid process. Otherwise he had always been a strong, healthy boy. In 1921 he was athletic champion of his college. He took part in all sports, especially boxing and baseball.

Present illness. Began after an injury on July 20, 1921. The injury consisted of a wrench to his back while lifting a large bag of potatoes on his shoulder and then into a dining car. The discomfort was mild at first, but had gradually been getting worse, until he was hardly able to bend forward. In the beginning of August he went to work attending a gasoline engine. This involved cranking the engine. He found that this action caused a return of the pain in his back, and it now began to radiate down the anterior and inner aspect of both thighs as low as the knees. Since the beginning of September there had been tenderness in the lumbosacral region. He had also noticed that if he stubbed his toe while walking he experienced a severe pain in the lower part of the back. The pain had gradually become

worse. Bowels had always been regular; occasional attacks of diarrhœa when in camp. No gastric trouble. No history of cough. No venereal disease. No urinary symptoms. I was asked to see the patient on September 21, 1921.

On examination, it was barely possible to recognize the strong man of 4 months previously. He was pallid, emaciated and haggard, complaining of constant severe pain down the front and inner side of the right thigh. Urine examination gave no abnormal findings. The Wassermann report was negative. Blood examination showed: hæmoglobin, 55 per cent; red blood cells, 3,788,000; anisocytosis, slight; color index, .75; leucocytes, 12,800; polymorphonuclears, 86 per cent; small lymphocytes, 14 per cent.

A roentgenogram of the lumbar region taken September 7, 1921, had been reported as showing no abnormality. A second roentgenogram was taken on September 19. It showed definite curvature of the lumbar spine, loss of substance on the right side of the third lumbar vertebra with detachment of the right transverse process. The outline of the right psoas muscle was not clear. Opaque masses were observed overlying the right and left sacro-iliac regions, but their significance was not appreciated. Two possibilities were considered: (1) tuberculosis and (2) sarcoma.

Against tuberculosis was the extreme pain and the very rapid cachexia. Against sarcoma was the extreme rarity of the condition. There was no suggestion of a primary lesion in the thyroid or prostate, and the negative urinary findings did not direct one's thoughts to the kidneys. With the diagnosis of tuberculosis, a spinal fusion operation was performed on September 23, 1921, the vertebræ dealt with being the second, third, fourth, and fifth lumbar, and the sacrum. Patient stood the operation very well and for a week or two slept better and was more free from pain. Thus the report for September 28 and 29 is: "Not complaining of any discomfort." September 30: "Very comfortable; no pain, but unable to sleep." On October 17, for the first time since operation, he complained of some pain in the right thigh. For the next few nights he did not sleep well. On October 20 a swelling was noticed in the right Petit's triangle, and was demonstrated to a colleague as a typical lumbar abscess. As the swelling continued to increase in size it was aspirated on October 26. Pure blood was drawn off. Microscopic examination failed to disclose tumor cells. However, in view of the fact that pure blood was obtained, the diagnosis reverted at once to sarcoma, and patient was again roentgenographed. The amount of destruction that had occurred in the month since operation was staggering. From this time until death occurred patient's condition steadily deteriorated. Morphia was given freely, the one indication being to keep him as comfortable as possible, and to do without moving him lest he literally break in two. Patient's appetite failed and emaciation became extreme. Paralysis of the right lower limb soon became complete, and this was followed speedily by paralysis of the left lower limb. The lumbar swelling increased very considerably in size; it became hot, rather tender, with dilated veins over the surface. Pain referred to the right lower limb was almost constant. He developed considerable difficulty with bladder and bowels, owing to the severe pain associated with the slightest movement, and the matter of nursing became extremely difficult. This was accentuated by profuse perspiration, probably associated with the administration of morphia. On November 3, 1921, a very large mass was palpable in the right iliac fossa. From this time onward pain was complained of in the neck, in the upper limbs, abdomen and lower limbs. Both lower limbs became markedly œdematous. Death occurred on November 27, 1921. The temperature chart (Fig. 9) shows the degree of fever.

After death a complete roentgen-ray examination was made. This showed widespread bony metastases as illustrated in accompanying photographs. A postmortem examination was made by Dr. William Boyd. His report follows:

Clinical diagnosis: sarcoma of spine. Surgeon in charge: A. Gibson.

External examination. The body was profoundly emaciated, and the face appeared to be that of a man of 40 rather than a boy of 20. Over the sacrum there were recent bedsores, and to the right of the lower lumbar vertebræ there was a soft, apparently cystic swelling, 3 inches in diameter.

Inspection of cavities. The *spine* was exposed throughout its entire length, both on its anterior and posterior surfaces. Three distinct tumor masses were found. The first was an enormous mass growing from the lower lumbar vertebræ, and already noticed on external examination. The second was an elongated swelling, 1 inch in length, and situated on either side of the dorsal aspect of the second dorsal vertebra. It was yellowish white in color, and of the consistency of hard butter. The third was situated in a similar position in relation to the second cervical vertebra. It was 2 inches long, and of the same consistency as the second. Both of the latter growths were closely incorporated with the bodies of the vertebræ.

The tumor in the lumbar region merits further description. It was a huge, soft, fluctuating mass which surrounded the bodies of several of the vertebræ in front and appeared on either side of the spine behind. It contained an immense quantity of thin, bloody, grumous material, which readily flowed away when the mass was incised. The bodies of several of the vertebræ were incorporated in the mass and completely destroyed. The cut surfaces showed a ragged mass of dark-red granular material, in which numerous but definite bony masses could be felt. One part, less necrotic than the rest, displayed on section a mass of telangiectatic cavities filled with bright red blood.

On the third rib on the left side, 2 inches from the middle line, there was a soft elongated mass 1 inch

SUMMARY OF CASES OF BONE METASTASES ON RECORD

Cases 1–15 are recapitulated from the article by Scudder

	Author	Sex	Age	Bones	Remarks
1	Albrecht	?	?	Skull	Diagnosed as sarcoma.
2	Albrecht	?	?	Occipital bone	Nephrectomy 4 mos. before. Death 6 mos. later. No other metastasis.
3	Albrecht	F.	60	Left femur	Spontaneous fracture, amputation 5½ yrs. later, kidney tumor. Urine always negative.
4	Albrecht	M.	42	Frontal and temporal	Hypernephroma at autopsy. Urine contained albumin.
5	Albrecht	?	48	"Knee-joint"	Amputation. Death. Hypernephroma. Urine contained some leucocytes.
6	Albrecht	F.	66	Clavicle	Hypernephroma. Diagnosed tuberculosis. Urine contained a few leucocytes.
7	Loewenhardt	?	?	Clavicle	
8	Von Bergmann	?	?	Tibia	Pulsating tumor.
9	Israel	?	?	Rib, thigh	First signs of disease.
10	Kuster	?	?	Calvarium	First sign.
11	Kuster	?	?	Rib	First sign.
12	Scudder	M.	34	Humerus	Amputation. Urine normal. Diagnosed sarcoma.
13	Scudder	F.	40	Left frontal, right parietal, left humerus	
14	Scudder	M.	75	Left femur	Hypernephroma of right adrenal. Multiple metastases.
15	Scudder	M.	33	Right humerus	Hypernephromata both adrenals. For 6 yrs. metastasis in pinna. Marked terminal cachexia.
16	Storath	?	?	Nasal cavity	Pulsation.
17	Eshner	F.	60	Sternum	Diagnosed as aortic aneurysm.
18	Bland-Sutton	M.	45	Humerus	Diagnosed as myeloma—excision. Recurrence 2 years later. Death 5 years later.
19	Warren Low	M.	55	Clavicle	Spontaneous fracture. Death "a year or two afterward."
20	Nitch	M.	52	Ulna, rib	Upper third of ulna. Diagnosed tuberculosis. Growth recurred to original size in 6 months.
21	Nitch	F.	?	Right humerus, left scapula	Diagnosed sarcoma. Secondary to adrenal carcinoma till then unsuspected.
22	Nicholson	F.	19	Tibia	Two years later, recurrence with palpable abdominal tumor.
23	Bevan	F.	Child	Femur	Spontaneous fracture. Death with "almost entire skeleton involved."
24	Macleod and Jacobs	M.	51	Sternum	Pulsation. Tumor size of orange.
25	Macleod and Jacobs	M.	69	Sternum	Tumor 3½ by 6 inches. Tumor in left kidney.
26	D'Agata	M.	56	Parietal	Size of hen's egg. Growth rapid.
27	Bullowa	M.	65	9th and 10th thoracic vertebræ	Tumor in back. Pure blood. Transverse myelitis. Autopsy: Tumor left kidney size of tennis ball.
28	White	M.	28	Os calcis, tibia, femur	Marked pulsation. Diagnosis: Alveolar sarcoma.
29	Le Count	?	?	Ilium, sacrum, femur	Highly malignant.
30	Garrow and Keenan	M.	49	10th and 11th thoracic vertebræ	Grew into spinal canal. Practically no urinary symptoms.
31	Affleck and Leith	M.	46	Sternum ribs	Glands involved. Thrombosis of vena cava inferior.
32	Pool	M.	57	Fibula and tibia	Emaciation. Diagnosed as sarcoma. No kidney symptoms till later.
33	Mouisset and Chalier	F.	24	Occipital, body of sphenoid.	(Quoted by D'Agata.)

in length, which, when incised, was found to contain masses of lime salts.

The heart, liver, spleen, pancreas, adrenals, stomach and intestines showed no abnormality.

The *lungs* were of normal size and color. On section numerous small irregular areas could be distinguished with great difficulty, but were readily detected by the palpating finger. Their consistency was very soft.

The *kidneys* were of normal size, but on section the cortex was swollen, pale and atty looking. The medulla appeared normal.

The *bladder* was greatly distended, and scattered over the surface of the mucosa were numerous small bright red hæmorrhagic areas.

Report of sections. (*1.*) *The tumor of the spine.* The greater part of the section is made up of blood clot. Around the periphery of the clot there is a zone of cells. These cells are large epithelial-like cells with an abundant cytoplasm and a large vesicular nucleus. They are arranged in definite clumps or solid acini separated by a scanty, although quite distinct, fibrous stroma. The cells are of fairly uniform size, but some are considerably larger, and almost merit the name of giant cells. Mitotic figures are fairly numerous. It is evident that this is not an example of sarcoma of bone. The cells are epithelial in type and most definitely epithelial in arrangement. It appears to be secondary growth from some carcinoma which was not discovered at the autopsy. The cells have not the clear or slightly foamy cytoplasm so characteristic of a hypernephroma.

2. Growth from shoulder. The appearance is similar to that just described except that no blood clot is present. The masses of epithelial cells are very definitely elongated and in places almost columnar. Vascularity is very marked but the cells are not grouped around the blood vessels in any particular arrangement. Small pieces of bone are seen here and there.

3. Tumor of the rib. The appearance is identical with that just described.

4. Lungs. The small nodules in the lung which were thought clinically to be metastatic in nature are in reality areas of pneumonic consolidation. The alveoli are filled with cells mainly mononuclear together with a few threads of fibrin. The blood vessels were moderately dilated.

The roentgenographs and microscopic sections of the tumor tissue were submitted to Dr. J. C. Bloodgood of Baltimore. He very kindly reported as follows:

"The patient is a male, age 20. This practically excludes primary carcinoma of breast, thyroid, and prostate, but at this age we might see hypernephroma, cancer of the intestine, and periosteal sarcoma. . . . The tumors of the vertebræ that are associated with hæmorrhage are the giant cell—the perithelial angiosarcoma—and the hypernephroma. I would not expect it in metastatic carcinoma of any type. . . . Primary sarcoma of bone rarely metastasizes to bone. Histologically this is not a multiple myeloma. It seems to me that it must be looked on as a metastatic hypernephroma."

The roentgenographs taken after death show the widespread bony involvement. There is apparently no metastasis in the skull, but the second cervical vertebra is practically destroyed In the thoracic region there is only equivocal evidence of secondary growth in the vertebral bodies though it is clear enough in one of the ribs.

The lumbar region of the vertebral column is most interesting. From the very beginning the second lumbar body seemed distinguished by greater density than normal, and to the last it has resisted infiltration more than the others, though the first above it and the third below are so destroyed as not even to be recognizable as ghosts of their former selves. This resistance of the second lumbar body is very noteworthy.

The sacrum and pelvis are so riddled with growths that no detailed description is possible. It is also rather remarkable that the limbs should have escaped involvement to the extent they have done. In both upper limbs the lowest limit reached is the upper third of the shaft of the humerus. In both lower limbs there is no involvement lower than the level of the lesser trochanter of the femur. This distribution of the metastases is much more suggestive of a lymphatic than a hæmal distribution.

The manner in which bony tissue has melted like snow before the sun is very striking. It suggests strongly that some fairly strong acid medium has been in contact with these bones. So far as I am aware no observations have as yet been made upon the hydrogen-ion content of tissue fluids.

Of malignant conditions which may manifest themselves in bone, it is impossible that any epithelial growth can be primary. The primary growths are essentially of the connective-tissue type. Secondary carcinomatous growths may come from many sources, chief of which are the breast, the thyroid, the prostate, the uterus, the kidney, the alimentary tract. To these may be added the liver as in a remarkable case described by Catsaras. H. G. Wells describes a case with secondary growths in bone, the primary growth being in the urinary bladder. With this multiple source of primary growths available the diagnosis is very often a matter of exclusion of primary foci, one by one, or of finding confirmatory evidence in one primary site. This evidence may have been missed or undervalued. In a suspected hypernephromatous metastasis, what are the renal signs and symptoms to be investigated?

The cardinal symptoms of hypernephroma of the kidney are hæmaturia, pain, tumor. The hæmorrhage is said to have a twofold source, first, from veins in the kidney substance congested by mechanical pressure of the new-growth; second, from the vascular tumor substance which has erupted into the pelvis of the kidney. The hæmaturia may be slight or profuse, it may be constant or intermittent. It is sometimes provoked by exercise or trauma. Hæmaturia is said to be "the first indication of the disease in more than half the cases." (Lilienthal.)

Pain is usually vague, indefinite and is referred to the lumbar region. It is said to be the initial symptom in about 30 per cent of cases. Renal colic is rare. When nerves are involved by tumor tissue, the pain may radiate in the distribution of these nerves, especially the ilio-inguinal and genitocrural. (Trotter.)

Tumor is found in many cases. In many others it is absent even at a late stage of the lesion.

Rise of temperature is another striking feature of a case which is in active progress. Israel reports it as present in 57 per cent of his cases. The temperature may rise to 102 or even 103°, and may be for some time the only manifestation. The existence of a high temperature otherwise unexplained should always lead to a search for hypernephroma. The cause of the fever is quite unknown.

Cachexia as a late phenomenon is at times very striking. This was pronounced in the case described by Burton Chance; one of Scudder's cases lost 30 pounds in 3 weeks, and in the case of C. S. the rapid emaciation was very noticeable.

It is possible for hypernephroma to exist along with other kidney lesions, e.g., tuberculosis (Albrecht) or calculus (Nogueira).

In regard to the treatment of hypernephroma, three sets of conditions have to be considered: (a) with no obvious metastasis, (b) with a solitary metastasis, and (c) with multiple metastases.

There can be little question regarding the first. Provided the other kidney be functioning, extirpation of the involved organ should be performed.

Where a solitary bone metastasis is present it is apparently worth while to remove the primary lesion in the kidney at the same time, if it be feasible to excise the metastasis. Two cases are recorded by Albrecht where the single bone metastasis was the only sign of general involvement manifested at autopsy. Another case is referred to by him where nephrectomy had been performed 12½ years previously; 3 years later a single metastasis in the scapula had been removed. At the date of writing, i.e., 9 years after the second operation, the patient was alive (quoted by Trotter).

Scudder, in recording a complete report on a case, first described by him in 1906, in which a shoulder-joint disarticulation was performed for a growth in the upper end of the humerus, mentions that when the patient died "a little less than 5 years after operation, wasting away as if with some blood disease," a complete postmortem examination was made of thorax, abdomen, and cranial cavity. No metastases were found in any part of the body. "The left kidney was as large as two adult fists. The man had had no symptoms so far as known from the kidney tumor. This case adds one more bit of evidence to the two cases from Hochenegg's Clinic, illustrating the fact that one bone metastasis may be the sole metastasis present in the body. Had a nephrectomy been done soon after the removal of the upper extremity containing the metastatic focus, the man's life would have been prolonged."

One difficulty that may present itself is that even with a metastatic bone deposit there may be no indication even on ureteral catheterization, or methylene blue injection, as to which kidney is involved (Pool). The fact that a primary tumor may not communicate with the pelvis of the kidney, or may be situated at one or other pole of the kidney, where it is incapable of producing symptoms by mechanical pressure, may lead to difficulty in deciding which side to explore. In such cases the method of perirenal inflation introduced by Carelli, and described by Hernaman-Johnson, may yield valuable information, at a smaller surgical cost, than a double renal exploration. It is claimed that the suprarenal gland can be

distinguished from the kidney by this manœuvre; if the procedure establishes itself, it is possible that it may be of considerable value in cases of hypernephroma.

In the presence of cachexia or of multiple metastases, operation would seem definitely contra-indicated. The only measures applicable are palliative. In any case as soon as there is reason to suspect hypernephroma a complete roentgenographic examination of the skeleton should be performed.

SUMMARY

1. Hypernephroma is a comparatively rare condition.

2. Bone is a "tissue of predilection" for this tumor.

3. The pathogeny of hypernephroma is still *sub judice*.

4. Metastasis to bone is chiefly via the blood stream.

5. The bony metastasis is sometimes the only metastatic focus.

6. Complete skeletal roentgenographic examination should be made in every suspected case.

7. While mainly a lesion of later middle life it is found in the young.

8. The malignancy of the condition varies enormously.

9. A solitary bone metastasis may be extirpated with good ultimate result.

10. In the presence of cachexia or multiple bone metastases, palliative measures only are advisable.

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INTRA-ABDOMINAL ADHESIONS[1]

By JOHN B. DEAVER, M.D. F.A.C.S., Philadelphia

THE subject of adhesions is gaining in importance especially since the diagnosis has been enhanced by the aid of the roentgenogram; but the cure of the condition still remains one of the less encouraging aspects of our surgical work.

As it is generally considered, the subject may be said to fall into two large groups: congenital and acquired. A somewhat extensive literature has developed around the question of congenital adhesions, particularly since Jackson, Lane, Harris, and others have described the congenital anomalies in the forms of membranes, bands, kinks, which bear their names. The anomalies are sometimes regarded as the result either of failure of the gut to rotate and descend, or when rotation has taken place normally, as due to some anomalous development of the peritoneum and the mesentery. Not a few surgeons, myself included, steadfastly refuse to accept this non-inflammatory theory of such adhesions, bands, membranes, or whatever they may be termed. It is much more plausible to place the entire group in the other large division of our subject, that is, acquired adhesions.

These acquired adhesions fall into two natural divisions: inflammatory, including pelvic adhesions often due to collections of blood in the pelvic cavity; and peritoneal (operative). Those who oppose the theory of fetal mal-development as the cause of membranes, bands, etc., are almost unanimous in pointing out the striking fact that they are usually located at or near the part of the gut most prone to inflammation. It is no contradiction to admit the presence of the condition in the fetus or at birth, for there is enough evidence to show the possibility of pre-natal inflammation of the peritoneum to account for their presence, so that while they may be congenital they are not developmental anomalies, in the strict sense of the term.

Inflammatory adhesions may be constructive as well as destructive. It is a well-known fact that the serous covering of the inner wall of the abdominal cavity is unique in that it is capable of developing agglutinations and adhesions, which in some instances are benign and protective, such as occur in the familiar walling-off process which takes place in infectious conditions and which prevents the development of a diffused peritonitis. It is when nature fails to protect the abdominal cavity in this way that she invites death, unless early surgery can be resorted to with success. These adhesions are generally temporary, inasmuch as they usually become absorbed after the infectious process has subsided. The surgeon often imitates this method of nature of forming protective or constructive adhesions, which frequently are only coils of intestines lightly stuck together, when he introduces sheets of rubber, cigarette drains, and the like into the wound, the object being to have the infected portion of the peritoneal cavity shut off from the general peritoneal cavity.

Constructive adhesions are also seen in cases of spontaneous recovery from gunshot wounds of the abdomen, as well as in wound healing in the various anastomotic operations, when union of the opposed peritoneal surfaces of the two viscera takes place.

The responsible factor for the development of acquired adhesions is, in a word, the peritoneum under distress. That is to say, they are the result of peritoneal warfare against pathological bacteria. The peritoneum is a large complex membrane lined over its entire surface with a layer of endothelium the continuity of which is interrupted only at the fimbriated orifices of the fallopian tubes; its two functions being absorption and exudation. So long as the endothelial cells remain intact, the peritoneum can deal with and control infection, but when they are destroyed and displaced by a mechanical, chemical, or bacterial agent, a direct route is at once opened for the entrance of infection into the blood stream through the subendothelial vessels; the surrounding connective tissue then becomes the source of adhesions. In the very

[1] Read at the twenty-fifth anniversary meeting of the Jersey City Practitioners' Club, Jersey City, New Jersey, May 8, 1923.

early stages of the inflammatory process of a peritonitis, there is a serous effusion containing phagocytic cells. These cells rapidly ingest bacteria, which they carry to the subendothelial lymph spaces on the surface of the diaphragm. This protective serous effusion with its contained phagocytes destroys the infecting bacteria and carries other infectious agents away from the peritoneal cavity. In addition to this serous effusion there is formed a fine layer of fibrin which covers the visceral layer of the peritoneum. We must not lose sight of the fact that, in severe infections, the phagocytes may all be destroyed and the effusion thus lose its protective properties and become septic. The agglutinations of the coils of bowel, or constructive adhesions, referred to above, are due to their being covered by this fine layer of fibrin. At operation this is frequently seen in the form of plaques or masses, which formerly the surgeon wiped away, but which today he leaves undisturbed since he is aware of the defensive power of the peritoneum. This fibrinous layer serves to protect the endothelium from the action of toxins and enables the intestinal surfaces to adhere, thus mechanically limiting the spread of infection; it also provides fine strands or ladders along which the phagocytes may travel on their way to the scene of action of the peritoneal battle.

It is an easy transition from a consideration of constructive to the consideration of destructive adhesions of the peritoneal cavity. We are all aware that the most frequent site of troublesome adhesions is the upper right abdominal quadrant. The viscera most frequently involved are the gall bladder, the duodenum, and the transverse colon. The etiology of these particular adhesions is not far to seek, but whether or not they can be prevented is not so easy to say, except perhaps if every case of cholecystitis or other upper abdominal disorder were to be subjected to operation at the first sign of trouble, which even I would consider neither feasible nor even logical. With the involvement of the intestinal tract in the inflammatory process there arises the greater danger of intestinal obstruction with all its inherent seriousness. Unfortunately, many of these cases present symptoms of stasis and partial obstruction rather than those of actual inflammatory disease of the intestine, so that the surgery which might have relieved the inflammation and possibly prevented the development of adhesions is postponed. On the other hand, oftentimes visceroptosis is responsible for symptoms of adhesions. This, of course, is not a surgical condition, but for which operation is often erroneously undertaken with the idea of relieving some supposed upper abdominal lesion. With the X-ray diagnosis of visceroptosis this mistake should not occur, but where this means of diagnosis has been omitted or is not available, the mistake is a very natural one, for it is sometimes absolutely impossible to differentiate visceroptosis and upper abdominal disease.

While surgery designed to relieve inflammation may also at the same time prevent the formation of inflammatory, destructive adhesions, we must humbly confess that surgery also is responsible for the development of troublesome adhesions. The various methods devised for the prevention of such operative sequelæ form an interesting chapter in surgical endeavor.

Among the many factors held responsible for the formation of postoperative adhesions may be mentioned free blood in the peritoneal cavity, sutures and ligatures, the effects of the eschar of the cautery, exposure of the viscera to air, chemical irritation and infection. Regarding the presence of free blood alone as a cause, it can be said to be only a concomitant one in the presence of infection or trauma. Ligatures and sutures likewise cannot be held responsible, if properly and wisely applied and if the stumps of pedicles are carefully treated. The cautery, if thoroughly applied, without doubt prevents the formation of adhesions, but mild and insufficient heat may cause their development. Exposing the peritoneum and the viscera to the air not only produces shock but favors the formation of adhesions, but it seems superfluous at this juncture to urge careful technique in this respect, since it should be entirely a matter of course. Before the introduction of asepsis chemical irritation was an active factor, and today also experimental work with

iodine, iodoform, carbolic acid, etc., conclusively proves the rôle of chemical irritants as possible contributing factors to the phenomenon. The part played by infection in the development of both pre-operative and postoperative adhesions is obvious. It is trauma in the widest application of the term, and trauma is without doubt an important item in the formation of destructive adhesions.

The deduction is plain that first among the prophylactic measures stands careful operative technique; strict asepsis; avoiding trauma, mechanical and chemical; careful treatment of denuded surfaces; a minimum of handling of viscera, avoiding exposure of the peritoneum and viscera to air, the use of hot moist gauze pads for the protection of the abdominal cavity.

Literature abounds with suggestions for the use of various foreign materials for the prevention of postoperative adhesions. Various operators have advocated the use of non-absorbable membranes, intended to protect the surfaces until regeneration of the endothelium has taken place. But the results have not justified their claims to usefulness.

Various lubricants also are more or less widely employed in abdominal operations for the prevention of adhesions. But I doubt whether the results are any more encouraging than those obtained with the use of membranes.

Non-viable membranes, particularly Cargile membranes have been advocated in various quarters, but they have not survived their early enthusiastic supporters. Much more rational is the introduction of viable grafts of peritoneum and omentum. Senn, as early as 1888, showed by experiment that omental grafts from 3 to 6 centimeters in width and of sufficient length to surround the bowel, retain their viability and become adherent in from 12 to 18 hours, and are well supplied with blood vessels in from 18 to 48 hours. He also showed that scarifying the serous surface and the grafts promotes agglutination and vascularization. He recommended the method for operations on the intestinal tract, for re-inforcing enterorrhaphy and for covering stumps and peritoneal defects. This method with modifications has come to occupy an important place and widespread application in modern abdominal surgery, and to this day represents probably the most valuable means at our disposal for controlling the formation of adhesions.

Pre-operative and postoperative treatment also plays a certain part in the prevention of adhesions. Inciting peristalsis with the idea of liberating early adhesions and by constant motility of the bowel preventing their recurrence, formerly received and today also is receiving considerable attention, but it is neither logical nor effective, except perhaps in the few selected cases in which it has been reported as being successfully applied. Personally I am opposed to pre-operative and more particularly to postoperative purgation. All aperients act as irritating poisons on the intestinal mucosa. The resulting irritation renders the intestinal wall more easily penetrable by bacteria, and, furthermore, the active peristaltic contractions disturb the protective layer of fibrin with which the peritoneal layer of the intestines is covered, and thus create the chance for adhesions to develop. I do find, however, that having the patient get out of bed as soon as is consistent with conditions and with the pathology treated is a wise prophylactic measure. After discharge from the hospital, suitable exercises, such as gymnastics, swimming, etc., are useful for breaking up slight adhesions and perhaps preventing the formation of others.

The most serious immediate postoperative danger is, without doubt, intestinal obstruction, occurring from 3 to 10 days or more after operation. This sequel, of course, most commonly takes place after acute abdominal conditions, particularly acute suppurative and perforative appendicitis. The obstruction is practically always caused by adhesions which, at first constructive, later become destructive. But intestinal obstruction may also occur after operation on a clean abdomen, but the cases are so few and far between that the subject needs merely to be mentioned. Re-operation in these cases of acute postoperative intestinal obstruction is usually very successful and the end-results eminently satisfactory.

Less satisfactory and more perplexing are the cases of adhesions which lead to chronic intestinal stasis with its associated toxæmia and disability. Very often, as I have already indicated, this chronic condition is mistaken for visceroptosis and vice versa, and very often either or both are associated with neurosis. The trio, chronic intestinal stasis, visceroptosis, and neurosis, to my mind, is nothing less than diabolical. Surgery may be, but very rarely is, successful in these cases. I personally refer this type for medical treatment, recommending proper posture, fresh air, forced feeding, massage, hydrotherapy, and the like. There is little doubt that these cases are the source of profitable income to the various "pathies," chiro-, osteo-, and the like. To the surgeon they are troublesome because they are so often referred to him with a diagnosis of chronic appendicitis or chronic cholecystitis. In fact, it is remarkable how exactly they do mimic upper abdominal disease. In some instances removing the appendix, and perhaps the gall bladder, may be called for and may relieve the condition. But frankly, I do not like to operate on these cases, and more often refuse to use the knife than I apply it. They are the bugbear of the surgeon and the internist alike, and require time and patience for their relief.

You all no doubt have had the experience of having to operate two or three times on the same patient for the release of adhesions, and no doubt you also have observed the fact that there are fewer adhesions at the second and third operation than were present at the first. While this fact may be a hint on nature's part that in time many of the cases may clear up spontaneously, it is more plausible to regard it with satisfaction as one of the many instances in which surgery comes to the aid of nature in relieving a distressing condition for which nature frequently demands too much time.

COLLATERAL CIRCULATION IN CHRONIC OBSTRUCTION OF THE PULMONARY VEINS AND ITS RELATION TO AIR EMBOLISM FOLLOWING VARIOUS DIAGNOSTIC AND THERAPEUTIC PROCEDURES (PNEUMOLYSIS)

By KARL SCHLAEPFER, M.D., Baltimore
From the Surgical Hunterian Laboratory of the Johns Hopkins University

FEW data are given in the literature relative to the formation of collaterals following chronic obstruction (partial occlusion) of the pulmonary veins due to compression of the lumen from the outside by chronic inflammatory changes. During the winter of 1921–1922 I performed a series of experiments on dogs to study the anatomical changes following the partial occlusion of the pulmonary veins. A condition was created experimentally in one lung analogous to that found in clinical cases of chronic inflammation in the region of the hilus—generally of tuberculous origin—obstructing the backflow of the blood in the pulmonary veins to the left auricle. This condition can be compared to the stasis in the pulmonary veins in cases of a non-compensated heart lesion of the left side. The study of the pathologic-anatomical changes in the lung and the pleura in these experiments enables us to throw some light on the etiology of collateral formation observed in cases of chronic lung tuberculosis (Guyot, 1). It gives also an accurate explanation for the few cases of air embolism which occurred through these collaterals into the greater circulation and the right heart.

RÉSUMÉ OF EXPERIMENTAL WORK

A. Technique. The operation was performed on the left lung of medium sized dogs, using intratracheal insufflation anæsthesia. The animal was placed on his right side. By an intercostal incision (fifth interspace) the pleural cavity was opened and the hilus well exposed by retracting the lung of the dog backward. As a rule, there were three big veins entering the left auricle, taking up the blood of the upper, middle, lower lobes. Sometimes the pulmonary vein of the upper lobe was divided into a smaller upper and a lower one. With a ligature of heavy white silk (in one case with a silver wire) the lumen of each vein was reduced to one-third or one-quarter of its normal caliber, a probe being passed underneath the ligature during the tie. After perfect hæmostasis in the chest wound the cavity was closed with interrupted pericostal silk stitches, the lung being blown up at the same time to its normal volume. Suturing of the muscles in two rows, and of the subcutaneous tissue and the skin with silk made the closure very tight. The dogs stood this operation very well. No changes in the rate of the heartbeat or in the respiration were noted. When recovering from the anæsthesia the animals were less active for 1 or 2 days; respiration was deeper but more rapid, perhaps partly due to pain in the chest wound. These postoperative sequelæ showed great variability in the different dogs; 30 hours afterward some were quite as active as before the operation. Generally after 48 hours, sometimes earlier, the dogs were normally active. The variation of these sequelæ in the different dogs may be governed more by subjective feelings than by any physiological bases. Deeper breathing increases the gaseous exchange.

B. Findings. Following operation the size of the two lungs remains about the same for a short time (5 to 7 days). An engorgement of all the blood vessels of the obstructed side takes place as a result of the stasis. The blood flow through this lung is reduced. The physiological function becomes reduced also. On the non-obstructed side an increased blood flow is guaranteed by an elevation of the blood pressure in the lung artery (Underhill, 2), but especially by the dilatation of the capillaries outlining the air sacs. This causes an enlargement of the alveolar wall; the alveoli expand (v. Basch 3), the aeration surface becomes greater. A compensatory hypertrophy (expansion) takes place, and an enlargement of

the lung results. So we see the non-obstructed lung pushing the mediastinum to the obstructed side, particularly at certain anatomically weak points—in the dog, for instance, in the anterior upper mediastinum (Fig. 1). A second displacement (lower groove in the diagram) occurs anteriorly below the heart. A constant result due to the same mechanism is the interposition of the mediastinal lobe, a median lobule of the right lower lobe, between the left lower lobe and the diaphragm.

The formation of adhesions on the obstructed side was a very inconstant finding in the specimens. If present, these adhesions were restricted to the regions where the very friable endothelium (Boit, 4) was injured mechanically at the time of operation, either by retracting the lung in exposing the hilus region; or along the line of incision on the anterior chest wall, or in the neighborhood of the place of the partial occlusion of the pulmonary veins. In this way a synechia of the two pleural layers occurred along the mediastinal side and along the incision in the chest wall. This obliteration was, pathologically, a circumscribed fibrinous pleurisy. During the process of organization of this inflammation, capillaries were growing in from the lung side, from the mediastinum and the chest wall. These blood vessels form the basis for abnormal collaterals in two specimens described in detail below.

In a medium sized dog on which the operation was performed as outlined above, and which was sacrificed 3 months (85 days) later, the displacement of the mediastinum corresponded to the description given above and illustrated in Figures 1 and 2. The upper lobe of the right lung pushed the thin mediastinum over to the left, compressing the left lung quite considerably—the result of the compensatory enlargement of the right lung. An upper groove is formed in this way. By an analogous process, the middle lobe forms a lower groove below and anterior to the heart. In Figure 2, where the upper and middle lobes of the right lung were retracted laterally and a window cut into the lower mediastinal sheet of the right pleura, the mediastinal lobe is shown interposed between the left diaphragm and the lower left lung lobe, and lifting up the heart to a certain extent. This mediastinal lobe extends well over to the left lateral costal margin, passing behind the inferior vena cava. The pleural cavity adjacent to the mediastinum is obliterated to a great extent. The two pleural surfaces are firmly adherent. Arising from the upper and the lower lobe in separate groups a number of tortuous, enlarged veins are seen running between the adherent pleural layers and joining the left internal mammary vein posterior to the chest wall. The costal and diaphragmatic pleural surfaces are intact; no adhesions are present. Figure 3 shows the partial obliteration of the pleural cavity, between the mediastinum and the upper lung lobe. At the place where the two sheaths are glued together these new blood vessels issue from the lung and can be followed along the mediastinal pleura. The pericardium is fixed to the lung. Enlarged blood vessels underneath this thin sheath join the pericardiaco-phrenic vein. A third group of veins originates in the hilus region and from the mediastinal aspect of the lower lobe. These veins form the second group of new blood vessels running within the mediastinal pleura toward the chest wall, where they join the internal mammary vein.

The photographs, taken immediately after death, do not show the true proportion in size of the two lungs; the right one being considerably smaller as a result of its postmortem contraction, a sequence of its elasticity; the left lung keeping its size as during life, an effect of the chronic stasis and the increased fibrous consistency. The fact that the two postmortem lungs are about the same size proves that the reduction in size of the obstructed side is a moderate one. This is also illustrated by comparing the two lungs autopsied in the same way after the same lapse of time in cases where the pulmonary artery was ligated with or without resection of the phrenic nerve. The very marked stasis in the obstructed lung circulation is an impediment to further reduction of lung volume at this early stage.

On a second dog the same operation was performed on the left lung. The partial occlusion of the pulmonary veins was combined with crushing of the phrenic nerve for a distance of 2 centimeters. The animal made an uneventful recovery. He felt well and showed no signs

of respiratory distress. He was sacrificed after 4 months (130 days). When the anterior chest wall was removed, the same picture was found, showing the difference in the size of the two lungs, as depicted in Figures 1 and 2. No veins coming from the lung running to the internal mammary vein were seen. The two internal mammary veins were very small vessels running along with the corresponding artery. The left lung was adherent along the mediastinum; the few small adhesions along the scar of operation were easily separated. The remaining part of the costal and diaphragmatic pleura was free. By pushing the left lung to the right, the following very interesting findings were recorded (Fig. 4): A group of engorged, dark bluish blood vessels on the mediastinal aspect of the upper lobe is taken up by few large veins running with the phrenic nerve and emptying into the first intercostal vein. These veins are in communication with branches of a second group of vessels which have their origin in the region of the hilus as enlarged bronchial veins which run to the left of the œsophagus into the azygos vein together with the fourth left intercostal vein. Note in our first dog described above this venous tract was very insignificant. Along the anterior aspect of the œsophagus these bronchial veins are in communication with enlarged œsophageal veins which join the azygos vein together with veins from the diaphragm.

C. Discussion. These findings were present in two dogs out of a series of seven analogous experiments. Except in one dog sacrificed 2 days after the operation, whose pleural cavity was free, the same form of adhesions were found restricted to the mediastinal pleura, and in four cases to the scar. The size of the involved area varied considerably.

In the two cases referred to two different methods of overcoming the stasis in the lung are demonstrated: (1) by using new blood vessels crossing these adhesions between the two pleural sheaths and communicating, as in our first case, with the internal mammary vein. In this observation the pericardiacophrenic vein was also active as an outlet for the accumulated arterialized blood in the pulmonary veins. The latter was also encountered in our second observation; but in our second case the normal way through the bronchial veins became more patulous, enlarged, and tortuous, thus forming the second method of repair. The dilatation in the bronchial veins had taken place as far back as the smaller branches emerging from the lung surface. Also some of the branches communicating with the pericardiaco-phrenic veins and along the œsophagus with the œsophageal veins were dilated, and with their dark blue color, gave to the specimen a striking appearance.

As pointed out by Boit (4), the endothelial covering of the pleura is very easily injured; even when exposed to dry air for one-half to one hour, Boit found the lung surface of dogs dull and wrinkled. Later this endothelium became necrotic. This is the explanation of similar changes in our experiments, due to the exposure and to the handling at the time of the operation. This explains also the constancy of the circumscribed areas of adhesion formation along the mediastinal side of the lung and toward the line of incision in the chest wall. The number of adhesions is governed besides by a certain constitutional factor, because with the same traumatism on the pleura or peritoneum the reactionary adhesion formation varies in different animals and also human beings. The vulnerability of the pleura may differ in degree in different individuals. The reactionary fibrinous deposit at the point of injury, which glues the two surfaces together, is different also. New blood vessels grow into this fibrinous layer from the lung as branches of the pulmonary arterial system. From the opposite side also buds of blood vessels grow into the fibrin, which is gradually replaced by fibrous tissue. In the presence of a chronic stasis in the lung, as was obtained in these experiments by partial occlusion of the pulmonary veins, and in many cases of chronic inflammation in the deeper layers of a lung (tuberculosis) some of these blood vessels become enlarged. They form the basis for the collaterals between the pulmonary and the systemic circulation. On the cadaver Guyot (1) was able to prove the existence of such collaterals in many instances, although in only a few instances do they become so large as to cause the formation of an eventual air

embolus during a diagnostic or therapeutic procedure, such as a puncture or a pneumolysis. This will be considered more in detail in the clinical part.

The formation of new collaterals is one way in which nature tries to overcome a chronic stasis in the lung. Our second observation illustrates the other way, i.e., the use of existing efferent venous vessels of the lung, the bronchial veins, and their communication with the pericardiaco-phrenic vein into the veins of the upper thoracic aperture, and along the œsophagus with branches of the œsophageal veins. Certain minor anomalies within the lung in some cases favor the formation of collaterals by enlarging the bed of existing blood vessels. Usually these anomalies involve only the capillaries.

Affecting the larger branches of the pulmonary veins as a result of the persistence of certain embryological stages in adults, MacCready (5) was able to demonstrate large communications of the pulmonary veins with the subclavian, innominate, superior and inferior vena cava, and the azygos in several rare observations recorded in the literature or met with in 3 cases in the dissecting room of the anatomical department of the Johns Hopkins Medical School. In 2 cases the upper pulmonary vein of the left side opened into the left innominate vein; in the third case the upper pulmonary vein of the right side emptied into the superior vena cava, owing to the persistently patent communication of the splanchnic plexus surrounding the primitive intestinal tract, later also the lung buds, and the veins of the systemic and portal circulation.

In 1911, Tiegel (6) made a one-sided partial occlusion of the pulmonary veins in dogs. At autopsy several months afterward he found collaterals running through adhesions between the mediastinum, the pericardium, and the thoracic wall. In one specimen the new blood vessels on the mediastinal side of the lung were particularly striking. Tiegel explains the decrease of the primary stasis in the obstructed lung by this new outlet through these collaterals without paying special attention to the clinical importance of this pathologic-anatomical finding.

CLINICAL STUDY

a. Findings. Analogous changes in lungs with a chronic inflammatory condition in the region of the hilus which causes an obstruction to the backflow of the blood in the pulmonary veins are not so rare in man; but their frequency can only be determined by a thorough examination at autopsy in a large series of cases, as it was done by Guyot in a restricted number. We shall show in a subsequent chapter the different routes followed by these collaterals from the pulmonary into the greater circulation. The size of these new vessels and the frequency of their formation is of great clinical importance as a complicating factor following different diagnostic or therapeutic procedures in chest conditions. A study of collaterals passing from the upper lobe through adhesions to the chest wall and mediastinum would be particularly instructive, since it is in this locality that we most frequently meet with adhesions, the upper lobe being beside the common primary seat of a tuberculous process. These collaterals, by joining the internal mammary vein (as we found in our first case) set up a direct communication with the large veins in the neck, where the pressure is negative, thus giving rise to the possibility of an air embolism.

Experimenting on cadavers with long standing pleural adhesions, Guyot (1) injected the stem or one branch of the pulmonary artery with Prussian blue solution (glycerine-water suspension). In 11 out of 16 cases the blue passed through these adhesions; in 10 of these 11 cases an obstacle was present, the cause of which was a parenchymatous infiltration (tuberculosis, 7; pneumonia, 2). In one case the lung was atelectatic. Guyot produced adhesions in the lungs of dogs by injecting iodine and turpentine into the pleural cavity. The adhesions resulting from this artificial pleurisy were not patent for the Prussian blue injected in the usual manner into the pulmonary artery. Guyot concluded that this negative finding was due to a lack of obstruction to the blood flow of these lungs. The blood vessels passing through the adhesions were too small to become permeable for the dye.

In one case of caseous lung tuberculosis with cavitation the blue flowed through the

adhesions on the chest wall into an intercostal vein. In another case, also lung tuberculosis, an anastomosis with a diaphragmatic vein was found.

As observed in our experiments and verified clinically by Guyot's injections on cadavers, the pleural adhesions following fibrinous pleurisy in lung disease with a chronic obstruction of the pulmonary veins form the basis for collaterals between the pulmonary and systemic circulation. This takes place usually in deeper-seated inflammatory zones, as in chronic tuberculosis, particularly following a process of secondary contraction. The blood vessels which organize the fibrin deposit on the lung surface by communication with each other in the presence of this stasis, become the natural outlet for the blocked arterialized blood in the superficial parts of the diseased lung. As the pneumonic process becomes diffuse centrifugally from its primary focus, the stasis becomes more pronounced. These new collaterals leading into the greater circulation and the right heart develop more and more, counteracting the ill effects of the stasis in the lung. The more these collaterals enlarge, the greater becomes the danger of an air embolism, as will be described later. Forlanini assumed that in lung tuberculosis this vascular anastomosis quite frequently counteracts the increasing stasis in the pulmonary veins. Guyot's experiments, applied to a larger series of cases, would bring out very interesting findings and enlarge our knowledge of this abnormal repair process which takes place through the pleural adhesions. This would give us also a sound basis for calculating the frequency of the danger of air embolism when carrying out a diagnostic or therapeutic procedure on tuberculous patients.

b. Complications. Before taking up the report of cases of air-embolism through the greater circulation following different procedures on the lung, we have to consider briefly the pathologic-anatomical changes which confront us in these observations. The new collaterals, the result of persisting blood vessels grown in during the organization of a fibrinous pleurisy, become, as time passes, surrounded by fibrous tissue. In the presence of an infection this connective tissue becomes denser and denser. A constitutional factor may also be active in these cases. As we are dealing with a chronic condition, time is a great and essential factor. The blood vessels within the fibrous tissue are suspended: i.e., fixed and dilated. The tendency of this tissue to a secondary contraction favors particularly the dilatation of these veins, the walls being less resistant than the more muscular artery walls. When such a vein is injured mechanically, either by a puncture needle (puncture: pneumothorax), or by a blunt instrument (finger: pneumolysis), the veins cannot contract to their full extent, being hampered by their attachment to this inelastic tissue. The musculature of the vein, being weaker than that of the artery, becomes insufficient. The rent in the vessel wall remains open. A laceration of the new collaterals arising from the upper lobe and running to the innominate vein by way of the internal mammary vein brings about the same condition as that occurring in a goiter operation or a dissection of any other structure in the neck when a larger vein is torn; an air embolism into the right heart occurs. As we shall see later, not every air embolus becomes clinically manifest, especially in instances where the blood flow is slow, so that in the presence of air within the vessel too great inertia predisposes to clot formation.

A case of air embolus, probably into the greater circulation, following a thoracic *puncture* was published by Zink (7).

A woman, 40 years old, had tuberculosis of the right lung of 2 years' duration, the upper lobe especially being involved. Using the puncture (Forlanini-Saugmann) method, a partial pneumothorax with nitrogen gas was obtained. The first filling was performed without any complications; 400 cubic centimeters of nitrogen were injected. During the next treatment, while the cavity was being refilled, patient complained of oppression following the injection of 100 cubic centimeters of nitrogen. The filling was continued. After 300 cubic centimeters of nitrogen had been introduced, the pressure in the pneumothorax cavity was +12 water. The needle was withdrawn. For a while the doctor kept talking with the patient; then he started a physical examination of the chest, when the woman suddenly collapsed. She became unconscious, the pupils were extremely wide, the pulse could not be felt. A striking feature was a circumscribed patchy discoloration of the skin over the right forearm and around the puncture wound. There was marked cyanosis of the face. Following

rhythmic traction of the tongue the patient began to breathe again. She improved very slowly under the stimulation of analeptics; corneal and pupillary reflexes could be obtained again, but the patient remained unconscious for the rest of the day. She had a few attacks of general convulsion of short duration. No palsy could be made out. The next day the coma became deeper. A tonic contraction of the right arm appeared and became more and more pronounced. Cheyne-Stokes breathing became conspicuous, and the patient died 24 hours after the onset of the accident.

Autopsy. A great number of air bubbles were found in the pia veins; but as these veins were lacerated when opening up the skull the origin of these air bubbles remains uncertain. The right lung was fixed to the chest wall by firm adhesions. On the thoracic side of the pneumothorax cavity no signs of mechanical injury could be made out. At one place, where the adhesions were loosened up, a bloody effusion of the tissue was noted. No openings were found in any of the larger blood vessels. On section the right lung was full of caseous pneumonic areas. Two cavities, each one the size of a cherry, were seen. When taking out the heart no special attention was paid to the eventual presence of gas (nitrogen). Unfortunately the pathological findings of the autopsy are so incomplete that they do not explain clearly the clinical picture.

Zink assumes that the embolus originated in a vein of the thoracic wall. It is probable that an enlarged vein passing through the adhesions at the border of the pneumothorax cavity was torn off by the pressure in the cavity. The pathological findings in this lung account for the obstruction to the blood in the pulmonary veins in the superficial part of the lobe. This case illustrates very well the danger of breaking up adhesions over one lung in the endeavor to transform a partial pneumothorax into a total one by increasing the gas pressure. Jacobaeus (8) tried to diminish this danger by using the cautery (thoracoscope) to burn off the strands of adhesions along the costal wall, forming in this way an escharotic plug in the vessels crossing the adhesions.

We have to consider the presence of these new collateral veins along the mediastinal side of the upper lobe particularly when performing a ***pneumolysis*** in this area, i.e., when mobilizing the upper lung lobe by blunt dissection out of its attachment to the thoracic wall, to interpose a mass (fat, muscle, or paraffin) in the cavity thus formed, forcing the lung to a collapse by pressure from the outside.

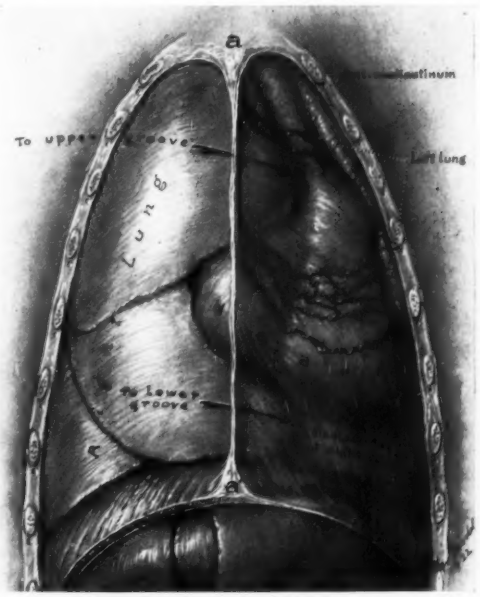

Fig. 1. Site of the organs of the chest in a dog, 85 days after partial occlusion of the pulmonary veins of the left lung. Note the displacement of the anterior mediastinum, of the heart toward side operated upon, and of mediastinal lobe owing to the enlargement of the right lung. Collaterals from the left lung through pleural adhesions running within the mediastinum to the left internal mammary vein. (The unilateral atrophy of the left side of the diaphragm resulting from resection of the phrenic nerve was taken from another specimen.)

In Delorme's (9) *decortication* for old empyema cavities, or in Ransohoff's (10) discission of the pulmonary pleura, the danger of this form of embolism into the greater circulation is present when the lung is liberated from adhesions to the chest wall. In the decortication or discission itself where the constricting, scarry coat over the lung is taken off or incised the usual origin of air embolism is through the lung veins (stretched in fibrous tissue) into the left auricle and into the systemic circulation (eye, brain). In the presence of pleural adhesions we have to think of abnormal collaterals through these adhesions to the upper thoracic veins as cause of an air embolus. In cases with death the autopsy will clear up the etiology of the fatal embolus. These two different sources have to be considered in the presence of an embolism following pneumotomy for the drainage of a lung abscess. When performing

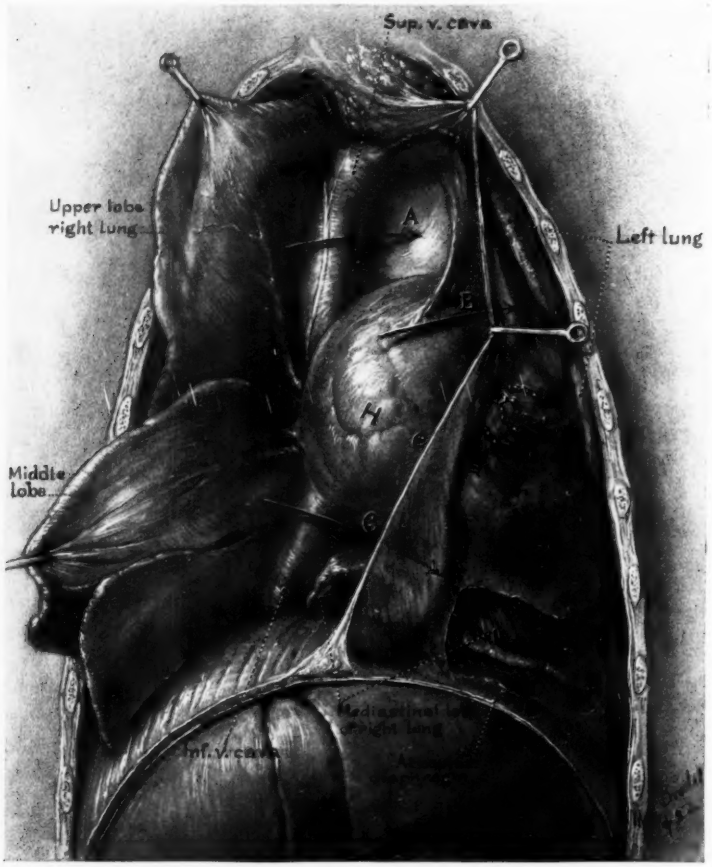

Fig. 2. Site of the organs of the chest of the same dog, as in Figure 1. Note the hollowing out of the mediastinum by the distended right lung. Interposition of the right mediastinal lobe between the diaphragm and the left lung. Collaterals between the left lung and the left internal mammary vein. (Unilateral atrophy of the diaphragm on its left side following resection of the left phrenic nerve taken from another specimen.)

a pneumectomy of the upper lobe, these collaterals with the greater circulation have to be kept in mind. A case is reported by Beneke (11), who, in reviewing the literature and by a questionnaire among the competent colleagues of that time, was unable to get the record of an analogous observation. This unique case from the Garrè clinic, in which the etiology of the incident was discovered at autopsy, may be quoted as a further proof of the importance of this special clinico-pathological entity.

A man, 47 years old, had suffered for one year and a half with a severe cough with expectoration. He was admitted to the clinic with the diagnosis of abscess of the upper left lung lobe. Under general anæsthesia, the second to the fifth ribs were resected on the left side anteriorly. The pleural cavity was obliterated by dense fibrous adhesions. Partly by sharp, partly by blunt dissection, the upper lobe was liberated on its mediastinal side toward the hilus, when suddenly a profuse venous bleeding from the bottom of the wound occurred. The anæsthetist noticed that the condition of the patient was becoming critical; the pulse could no longer be felt, the patient became pale, and lost consciousness. The wound was packed with gauze. With different analeptics a temporary slight improvement seemed noticeable, but a short time afterward the patient died. The autopsy performed the following day

showed that the left upper lobe had been liberated from scar tissue in an area the size of the palm of the hand. Some lung tissue was left attached to the mediastinal side. The surface of the lung was irregular, and showed several torn blood vessels. A large lung vein was exposed along the lung surface with a rent 5 millimeters in diameter in its lumen. This vein was 2 centimeters from the hilus, and separated from it by a bronchiectatic sinuous cavity which was outlined by granulation tissue and communicated freely with the main bronchus by a canal admitting one finger. In all the branches of the pulmonary artery of the right lung a great number of air bubbles were found. The heart was pale, relaxed, and seemed to be empty. There were air bubbles in the coronary veins. No ecchymoses were noted. The *right* auricle and ventricle contained frothy blood, particularly between the trabeculæ. The foramen ovale was closed. The arteries of the neck were not examined for a possible air content. The middle meningeal arteries were filled with a great number of air bubbles. The corresponding veins also contained air. This was very conspicuous in the longitudinal and the cavernous sinus, but also in the transverse sinus. There was air in the vessels of the spleen, in the veins of the liver, the bladder, and of the lower extremities.

In the case of Zink (7) there was in all probability an air embolus through the greater circulation. A more accurate description of the autopsy findings would help to settle the question. In Beneke's case (11), the frothy blood in the right heart, and the great number of air bubbles in the right lung indicate air embolism in the greater circulation. The air bubbles which were scattered throughout the systemic circulation reached it by way of the lung. In this case we are justified in assuming that an analogous collateral communication with the internal mammary vein had been formed, as in our first experiment. In Beneke's case, profuse bleeding necessitated the immediate cessation of the operation. The lung vein protruding from the lung surface may have been the new collateral. By packing the wound further embolus was stopped. An abscess close to the hilus was the cause of the stasis in the lung lobe. With its fibrous envelope the abscess compressed the larger vessels, chiefly the veins with their less rigid wall. A chronic obstruction was the predisposing factor in the formation of these collaterals. The extensive lesion of the left lung diminished its function to a great extent. As will be shown in a subsequent paper, under these conditions the unaffected lung assumes the function of the diseased side. In a lung, for instance, brought to physiological rest by ligation of the pulmonary artery, the opposite side enlarges, as has been demonstrated after one-sided pneumectomy by Heuer and Andrus (12). An enlargement of the capillaries in the sound side causes an active enlargement of all the alveoli, in this way enlarging the respiratory surface. Through these enlarged capillaries, the blood has an increased flow. An accessory factor in these cases is the higher blood pressure in the pulmonary artery, as has been observed by Underhill (2). This also explains why in Beneke's case so much air could pass through the sound right lung into the systemic circulation, and even later on through the capillary bed into the venous side of different organs, such as the heart, brain, spleen, liver, bladder, and the extremities.

The air emboli through these new collaterals of the pulmonary veins and the veins of the upper thoracic aperture show clinically the same picture as the emboli arising during operations on the neck (goiter, gland-dissection), where a vein in communication with the superior vena cava aspirates air on account of its peculiar position in the tissues. An additional factor may be the position of the neck at the same time. When air enters the right heart, it causes the mill-murmur, metallic in character and often so loud at first that it can be heard at a distance of 1 to 2 meters. The murmur is the same as that of water striking the wheel of a water mill. The clinical manifestations of such an embolus are rather due to the symptoms caused by the air entering the systemic circulation and going to the vital centers of the brain after having passed through the lung. This is particularly apt to occur when the patient is kept in an erect position. Kleinschmidt (13), reasoning from experimental observations, came to the conclusion that death following these accidents is due to the accumulation of air in the right heart. A discrepancy exists between the clinical picture in man and the experimental findings in dogs. Forlanini (14) slowly injected air intravenously in dogs; no symptoms followed. Gundermann (15) made the same observation. In

Fig. 3. Photograph of the specimen of the same dog, as in Figures 1 and 2. *C*, Collaterals from the pulmonary veins through pleural adhesions and within the mediastinum toward the left internal mammary vein. *P*, enlarged pericardiaco-phrenic vein with phrenic nerve. Pericardium adherent to the lung. Right lung contracted (elasticity).

dogs in a flat position I injected 60 cubic centimeters of air into the jugular vein in three consecutive injections at intervals of 3 to 5 minutes without causing any alarming symptoms. In my experiments, as in those of Forlanini, a loud mill-murmur was audible which became less pronounced within 5 to 10 minutes, and diminished gradually until after 15 minutes it subsided. Forlanini injected into dogs 10 to 15 cubic centimeters of air per minute for half an hour without killing the animals. Very rapid intravenous injections of air cause sudden death by dilatation of the right heart (Kleinschmidt, 13). This might explain the clinical symptoms of respiratory distress and heart failure observed in man even after a small quantity. With the patient in the erect position, an embolus into the brain and the medulla is more likely to occur. When I injected only 20 cubic centimeters of air into the right heart through the jugular vein in a dog in the flat position, and then elevated the head of the animal, respiration suddenly ceased and the heart stopped beating.

The prognosis is more favorable when the air emboli pass through the right heart than when air passes through the left heart. By injecting only 0.5 cubic centimeter of air into the left heart of a dog Forlanini produced a sudden death. If the embolism through the right heart becomes clinically evident it is generally because the air passes through the lung into the left heart and into the systemic circulation; we then have all the symptoms which I have described in a previous paper on intrapleural reflexes (16). The erect position facilitates aspiration of air when a vein in communication with the vessels of the upper thoracic aperture is injured. This position predisposes to the passage of air from the right heart into the pulmonary vessels, into the left ventricle and into the brain, causing there serious sequelæ. With the patient in the Trendelenburg position the opening in the vein is at a lower level than the heart; this position also tends to combat the progression of the embolus and to diminish the danger of air passing through the lung into the left heart and into the cerebral circulation.

SUMMARY

Our experiments on dogs demonstrate the formation of collaterals between the pulmonary and systemic circulation consequent to the chronic stasis following partial occlusion of the pulmonary veins of one lung. This gives us an explanation for certain pathological processes governing the changes in chronic inflammatory conditions with obstruction of the pulmonary veins of one lung in man. Guyot's injection experiments on the cadaver prove that a chronic obstruction to the blood flow in the pulmonary vein with pleural adhesions is the main factor in initiating the formation of these collaterals, nature endeavoring thus to counteract an increasing stasis in the lung. The enlargement of the normal venous pathway from the lung into the azygos vein (bronchial veins) is an additional factor used by nature in overcoming the chronic obstruction in the superficial pulmonary veins. The formation of new collaterals to the veins of the upper thoracic aperture is of greatest clinical importance. Having the pathologic-anatomical picture of this condition in mind, special attention is indicated in any cases of chronic lung tuberculosis when performing a puncture for diagnostic or therapeutic (pneu-

Fig. 4. Site of the left chest cavity in a dog 130 days after partial occlusion of the left pulmonary veins. Enlarged bronchial veins in communication with the enlarged pericardiaco-phrenic veins and with the œsophageal veins.

mothorax filling) purposes. When breaking up adhesions in the wall of a partial pneumothorax by elevating the pressure in the cavity, air embolism through these collaterals may occur (Zink). But also in other chronic inflammatory conditions (abscess, bronchiectasis) the same precautions are indicated, to prevent sudden, serious complications due to air embolism (puncture). During pneumolysis, pneumotomy, and pneumectomy we have always to face the possibility of the existence of these collaterals as a complicating factor. Beneke's case illustrates very well the clinical features of an air embolus of this type. The main danger in these operations is air embolism through the pulmonary veins and the left heart, as described exhaustively in my monograph on the intrapleural reflexes (17). The knowledge of these two sources of complications in various intrathoracic operations allows the surgeon to prevent the occurrence of air embolism by taking special precautions when

working in certain localities of the lung surface—those adherent to the chest wall or to the mediastinum. Preventive therapy is best. When confronted with an air embolus, stop the operation immediately; pack the wound thoroughly; lower the head and thorax (Trendelenburg position) so that the place of injury is situated below the level of the heart. This diminishes at the same time the danger of an air embolus into the brain. Stimulants may be used to strengthen and reinforce the heart action. Puncture of the right auricle and aspiration of the air, as advised by Delore (18), will prove very efficacious.

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DEPARTMENT OF TECHNIQUE

REDUCTION OF FRACTURES WITH THE FLUOROSCOPE

By E. L. ELIASON, A.B., M.D., F.A.C.S., PHILADELPHIA

THE majority of fractures, especially in the long bones, are associated with deformity at the fracture site. This deformity, as we know, is mainly due to the broken fragments being in an abnormal position, thrown there by vulnerating force and the muscle pull. As time elapses this deformity increases, due to the constant contraction of the unrestrained and irritated muscle. Meanwhile the associated hæmatoma undergoes organization, the exudate in the muscle bundles organize, tending to glue the bundle together and render the muscle less elastic and pliable. In other words, the earlier the reduction of a fracture, the easier it will be accomplished, for the natural position of the fragments is that of apposition. Furthermore, they will tend to stay in their reduced position much more readily if there is no tough, resisting blood clot filling up the fracture edges as well as the tissue space where the bone should be. The results of delay in reduction go even further than merely making reduction difficult. It will even decrease the chances of ultimate function. Femur shaft fractures, allowed to go 8 to 10 days unreduced will never be properly reduced except by open reduction. Now, as a proper reduction is easiest done early, and as our functional and anatomical results depend primarily to a great extent upon good reduction, it behooves us to accomplish this.

Fig. 1. *a* (above), First splint applied. The sterile dressing is laid back from the open wound and the fracture position inspected. *b*, Both splints applied.

Fig. 2. Mettledorpf triangle held with plaster-of-Paris bandage.

At present most fractures are rather neglected as regards efficient and early treatment. In private practice we are called to attend a recent fracture. The tendency is to attempt a reduction with or without an anæsthetic and, aided by a member of the family, a makeshift splint is applied. Or, if the case comes to the hospital there usually is a splint already applied and the resident physician looks it over, finds no glaring deformity and has the case sent to the ward to await an X-ray, which usually cannot be taken at once, especially if it is at night, a holiday or Sunday. In either case, the photograph if taken that day is not reported upon officially until the next day, so that the delay stretches from hours to a very likely 36 to 48 hours.

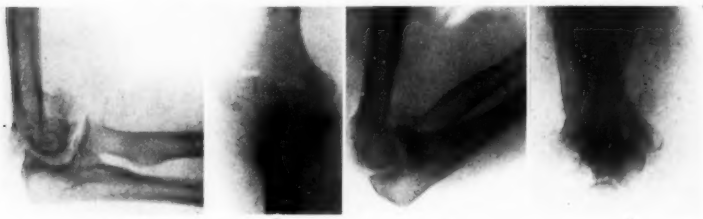
A second reduction, on a much swollen member, often now covered with blebs, is scheduled for the next day, and another X-ray to determine the corrected position is not heard from until the following day, bringing the delay up to 2, 3, or 4 days before we really know the true position of the fragments. In other words, we have anæsthetized twice, traumatized twice, and possibly wasted 2 to 4 days, all in a haphazard *blind* attempt to accomplish reduction. Then, in many instances, we are forced to do open reduction.

How much better if we would *promptly* use a fluoroscope for our reduction and not only feel but *see* that the replacement is correct.

It is perfectly true that a hospital and a fluoroscope is not always available, yet it is much easier to reach one in these days of medical enlightenment and standardized hospitals, than one would at first suppose. It is, of course, understood, that many fractures can be readily reduced and the palpating hand assures us that the position is all right. But how often have we been sure of an excellent reduction, only to find by X-ray later that the position is anything but good.

Today on the writer's services at the University of Pennsylvania and Howard Hospitals, all fractures are treated with the idea of promptness and direct vision reduction when indicated. A fracture is an emergency and is so treated. If shock

Fig. 3. *a* (above), First stage of dressing for open reduction of tibia and fibula fracture. The sterile dressing is laid back from the open wound to permit inspection of the fracture site. *b*, The second splint is applied and molded ready to be bandaged upon the limb.



a *b* *c* *d*

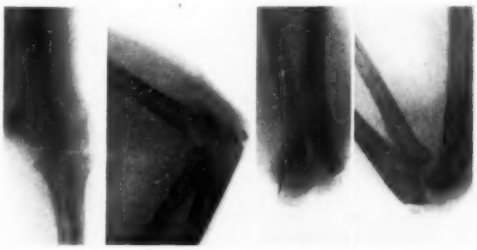
Fig. 4. Case 1. *a* and *b* were taken after second attempt at reduction; *c* and *d*, after fluoroscopic reduction.

exists that patient is given morphia, heat and fluids. The broken limb is slowly and gently placed in its position of muscle equilibrium or balance and weight traction with adhesive applied in the long axis of the broken bone. For the extremities, the Thomas arm and leg splints are the best. Unless the bone is subcutaneous, no effort is made at a formal reduction, until the X-ray is available.

At the earliest possible time the patient is taken to the fluoroscopic room and anæsthetized, preferably etherized, as ether is more easily administered in the dark with only a hand flash for light. Ether also gives better relaxation. If one does much of this work under the fluoroscope, it is well to wear leaded rubber gloves and apron. It is equally important from the patient's standpoint that your roentgenologist does not allow overexposure during prolonged endeavors. All manipulations do not demand the rays. A glimpse now and then is all that is needed. In fact, many of the cases can be reduced before using the ray at all except for confirmation of position.

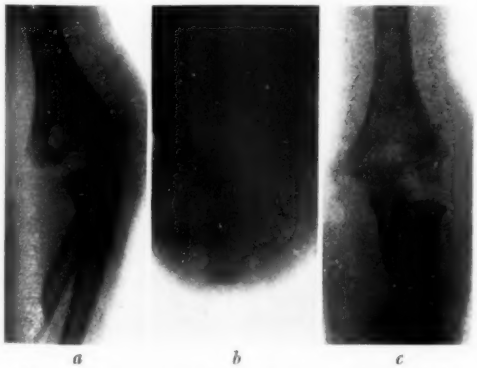
When the patient is thoroughly relaxed, the limb is placed in its position of muscle balance, which is, for forearm fractures, with a partially flexed elbow and the hand in the mid position between pronation and supination; for humerus fractures, with elbow partially flexed and arm abducted; for femur fractures, thigh and leg flexed, thigh 45 degrees and leg 90 degrees; and for leg fractures, the limb on the outer side, and the thigh and leg flexed, at about the angles mentioned above.

As one becomes a little experienced in this method of reduction, he will find that there are many little tricks and twists that will help to render reposition easier. In Colles' fractures, traction avails but little. Angulation backward



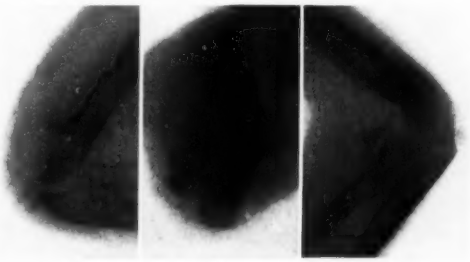
a *b* *c* *d*

Fig. 6. Case 3. *a* and *b* were taken after one attempt at reduction; *c* and *d*, after fluoroscopic reduction.



a *b* *c*

Fig. 5. Case 2. *a* was taken after one attempt at reduction; *b* and *c*, after fluoroscopic reduction.

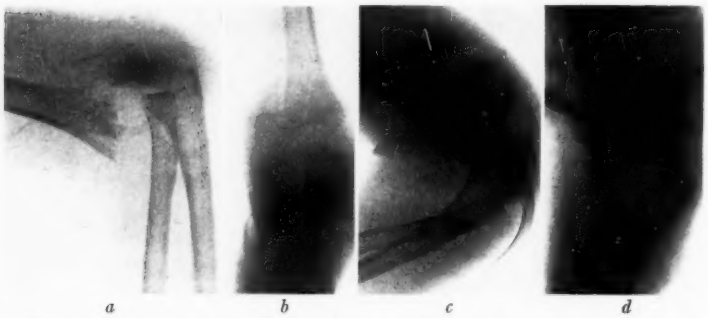


a *b* *c*

Fig. 7. Case 4. *a* and *b* were taken after fluoroscopic reduction; *c* shows a bony bridge which had formed and was broken while the physician was giving passive motion and massage.

a *b* *c* *d*

Fig. 8. Case 5. *a* and *b* were taken after one attempt at reduction; *c* and *d*, after fluoroscopic reduction.



a *b* *c* *d*

Fig. 9. Case 6. *a* and *b* were taken after two ordinary and one fluoroscopic reduction attempts; *c* and *d*, after open reduction.

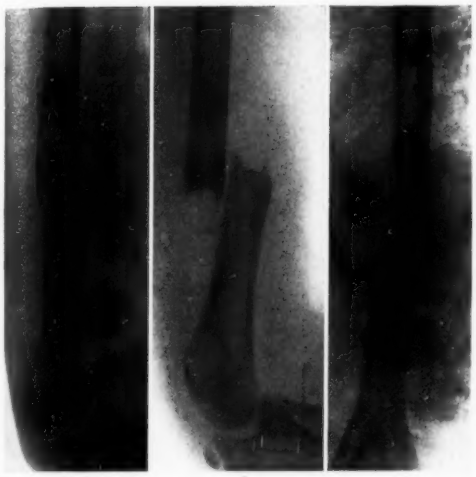
to as near a right angle as possible, forcibly, pressure downward on the lower fragment with the thumb of one hand holding above the wrist, the other hand grasping the patient's hand and bending it forcibly to the ulna side, at the same time internally rotating, as it is straightened out on the wrist, an assistant meanwhile making counter traction at the elbow, usually results in reduction.

If this corrects the overriding, the patient's hand is carried into a position of about 25 to 30 degrees flexion, at the same time abducted toward the ulna. A palmar plaster molded splint is applied reaching from the elbow crease to the metacarpophalangeal joints. The splint is held in place by a gauze bandage. Again the fluoroscope is used and any additional molding of the parts is accomplished as the splint hardens. A similar posterior splint is applied (Fig. 1).

If both bones of the forearm are broken near the lower extremity, it may be necessary here also to bend the hand backward to nearly a right angle, in order to engage the broken edges to act as a fulcrum. If this fails, abduction sharply to ulna side is tried, in order to engage the radial fragments first, later using the reverse procedure to accomplish ulna reduction. Plaster splints are applied one at a time as above.

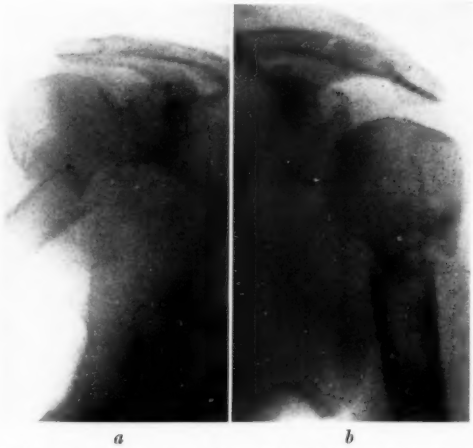
When the bones are broken farther up the shaft, traction, pronation, and supination and molding the ulna into position and endeavoring to hold it there with the thumb and forefinger, while the radius is reduced, gives the best results.

In fractures of the lower end of the humerus into and around the elbow joint, the earliest possible reduction should be accomplished, for these cases are prone to have excessive swelling, interference with circulation and later excessive callus formation in hæmatomata. This fracture is reduced in much the manner we would reduce a posterior dislocation at the elbow. The antero-posterior deformity is first reduced, the forearm



a *b* *c*

Fig. 10. Case 7. *a* was taken after two attempts at reduction; *b*, after fluoroscopic reduction, and *c*, six weeks later.



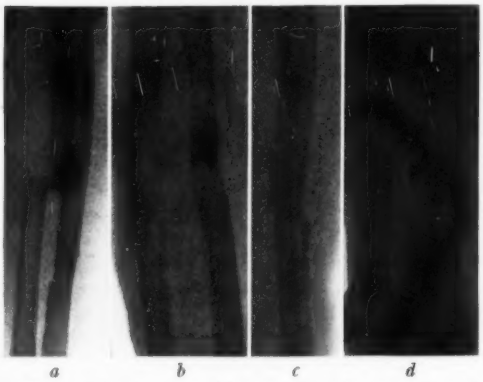
a *b*

Fig. 11. Case 8. *a* and *b* were taken after one attempt at reduction; *c* and *d*, after fluoroscopic reduction.

Fig. 12. Case 9. *a* and *b* show reduction under the fluoroscope.

a *b* *c* *d*

Fig. 13. Case 10. *a* and *b* were taken after one attempt at reduction; *c* and *d*, after fluoroscopic reduction.



a *b* *c* *d*

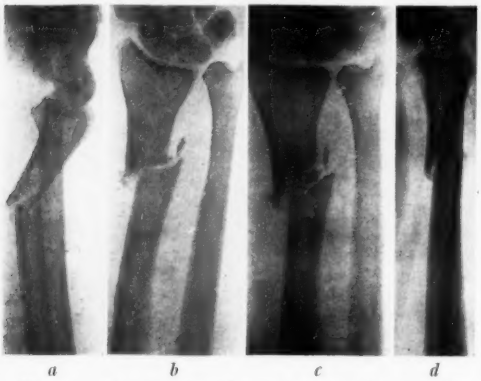
Fig. 14. Case 11. *a* and *b* were taken after one attempt at reduction; *c* and *d*, after fluoroscopic reduction.

a *b*

Fig. 15. Case 12. *a* and *b* show position after fluoroscopic reduction.

a *b* *c* *d*

Fig. 16. Case 13. *a* and *b* were taken after one attempt at reduction; *c* and *d*, after fluoroscopic reduction.

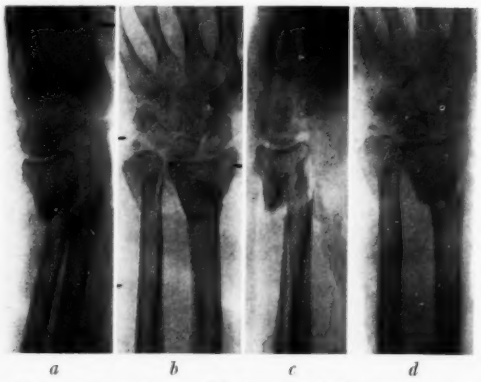


a *b* *c* *d*

Fig. 17. Case 14. *a* and *b* were taken after reduction and dressing on straight board splints; *c* and *d*, after reduction under the fluoroscope and fixation with plaster-of-Paris splints.

a *b* *c* *d*

Fig. 18. Case 15. *a* and *b* taken after two attempts at reduction; *c* and *d*, after open reduction.



a *b* *c* *d*

Fig. 19. Case 16. *a* and *b*, Compound fracture after two attempts at reduction; *c* and *d*, after fluoroscopic reduction.

Fig. 20. Case 17. *a*, taken after second reduction; *b*, after fluoroscopic reduction.

flexed and the fluoroscope used with the arm and forearm abducted and in the plane of the supine patient's body. If this view is good, the limb is brought to the patient's side with the hand on the shoulder of the injured side and a look taken. Should there be lateral displacement, the forearm is extended to about a right angle and the lateral deformity corrected. In Y fractures into the joint, with wide separation, the fragments can be sometimes approximated by a Spanish windlass applied gradually for a few moments. The limb is dressed in the Jones position.

Fractures of the middle of the shaft of the humerus are best reduced by traction in the abducted position. A plaster-of-Paris splint is then applied from axillary fold to bend of elbow. As this hardens the limb is carried to rest on a previously prepared Mitteldorpf triangle. After fluoroscopic confirmation of the reduction, the entire limb is bound to the chest with plaster-of-

a *b* *c* *d*

Fig. 21. Case 18. *a* and *b*, taken after second reduction; *c* and *d*, taken after fluoroscopic reduction.

a *b* *c* *d*

Fig. 22. Case 19. *a* and *b*, taken after one reduction; *c* and *d*, after fluoroscopic reduction.

Paris bandages, especial care being taken to give support to the elbow posteriorly, as sagging occurs here resulting in external bowing (Fig. 2).

In fractures of the surgical neck of the humerus reduction is obtained much as one reduces a dislocation of the shoulder by the Cooper method, using, however, the fist in the axilla in place of the foot. Very often it is necessary, in order to maintain reduction, to impale a sharpened process of one fragment into the spongy bone of the other fragment. Such a procedure was carried out in Case 8. This patient, seen 4 months later, had perfect motion and both shoulders are alike in contour. The arm and forearm are

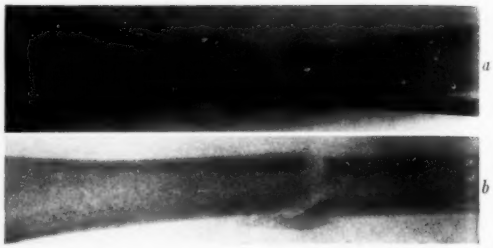
a *b*

Fig. 23. Case 20. *a* and *b*, taken after fluoroscopic reduction.

bound to the side with a pad in the axilla, and the fluoroscope again used.

Fractured femur cases do not lend themselves to this method except in fractures in youngsters that can be encased in plaster in the flexed position, Case 21, or in adults in which the line of fracture is more or less transverse, at least enough so to enable partial end-to-end locking of the fragments. These last-mentioned cases should be supported at once with a Thomas or Hodgen splint, and bone traction with tongs, or by means of adhesive if practical, applied before the last fluoroscopic view is taken.

In fractures of both bones of the leg, reduction is accomplished with the thigh and knee flexed and lying on its outer side, with traction on the foot by a Collins' cinch and counter traction at the knee. If the fragments engage somewhat, the limb is gradually straightened until the knee has but 10 to 15 degrees flexion. The fluoroscope is again used, an external lateral plaster splint is applied from mid thigh down to and around the foot. As this hardens, the fracture site is watched while traction on the Collins' cinch is relaxed. If the position holds, the internal splint is applied. One case of fracture of the upper end of the tibia running into the joint and with separation of the fragments, was reduced by means of the encircling Spanish windlass, compressing the parts until the splints were applied (Case 19). X-ray views are taken, preferably stereoscopic, of all cases after the splints become hardened.



a

b

Fig. 24. Case 21. *a* and *b*, taken after fluoroscopic reduction.

Many cases are not reducible and many, though reducible, cannot be held. Unless contra-indications exist, these cases are reduced by the open method as soon as the decision is made. Many times, in forearm and leg fractures, we can dispense with internal fixation after open reduction. Where the fragments can be interlocked the wound is temporarily left open and covered by a sterile dressing and bandage. A lateral plaster splint is applied escaping the incision. After this is hardened the sterile dressing is turned back and the fracture site inspected, the limb being moved so as to demonstrate any motion that might exist at the fracture site (Fig. 3). If all is satisfactory, the wound is closed and protected and the other lateral splint applied. But should the reduction not be maintained, internal fixation is used.

The accompanying roentgenograms show some cases in which reduction had failed one or more times, but was subsequently accomplished by direct vision. In a series of approximately 50 cases, including femur, tibia, and fibula; humerus, radius, and ulna, but two required open reduction, one a supracondylar fracture of the humerus with interposition of the musculospiral nerve and other soft tissue, the other a fracture at the lower end of the radius and ulna in which the ulna could not be reduced.

Case 1. Figure 4, *a* and *b* taken after a second attempt at reduction; *c* and *d* taken after fluoroscopic reduction.

Case 2. Figure 5, *a* taken after one attempt at reduction; *b* and *c* taken after fluoroscopic reduction.

Case 3. Figure 6, *a* and *b*, taken after one attempt at reduction; *c* and *d*, taken after fluoroscopic reduction.

Case 4. A film was not made of this case showing the deformity existing after the first reduction. It was observed through the fluoroscope and the usual lateral and anteroposterior displacement noted. Figure 7, *a* and *b*, were taken after fluoroscopic reductions; Figure 7, *d*, shows a bony bridge that formed and was broken by the physician while giving passive motion and massage.

Case 5. Figure 8, *a* and *b*, taken after one attempt at reduction; *c* and *d* taken after fluoroscopic reduction.

Case 6. Figure 9, *a* and *b*, taken after two ordinary and one fluoroscopic reduction attempts. It was found

impossible to engage the fragments and open reduction was decided upon. At operation the musculospiral nerve and other soft tissue were found between the fragments.

Figure 9, *c* and *d*, taken after open reduction.

CASE 7. Figure 10, *a*, taken after two attempts at reduction; *b*, after fluoroscopic reduction; *c*, six weeks later.

CASE 8. Figure 11, *a*, taken after two attempts at reduction; *b*, taken after fluoroscopic reduction.

CASE 9. This case showed under the fluoroscope a dislocation of the head of the radius and a comminuted fracture of the ulna with about one inch overlap. No film was taken.

Figure 12, *a* and *b*, show the reduction under the fluoroscope.

CASE 10. Figure 13, *a* and *b*, taken after one attempt at reduction; *c* and *d* taken after fluoroscopic reduction.

CASE 11. Figure 14, *a* and *b* taken after one attempt at reduction; *c* and *d* taken after fluoroscopic reduction.

CASE 12. Viewed under the fluoroscope after attempted reduction, this fracture showed a half-inch overlap in both bones.

Figure 15, *a* and *b*, show the position after fluoroscopic reduction.

CASE 13. Figure 16, *a* and *b*, taken after one attempt at reduction; *c* and *d* taken after fluoroscopic reduction.

CASE 14. Figure 17, *a* and *b*, taken after one reduction and dressing on straight board splints. The dislocated ulna permitted the angulation of the radius. *c* and *d*, after reduction under the fluoroscope and fixation with plaster-of-Paris splints.

CASE 15. Figure 18, *a* and *b*, taken after two attempts at reduction; *c* and *d* taken after open reduction, fluoroscopic reduction having failed on the ulna.

CASE 16. Figure 19, *a* and *b*, a compound fracture after two attempts at reduction; *c* and *d* taken after flurorscopic reduction.

CASE 17. Figure 20, *a*, taken after a second reduction; *b*, taken after fluroscopic reduction, where it was seen that the reduction was very easy but slipped with a straight splint dressing. A molded plaster splint with the wrist flexed held the fragments.

CASE 18. Figure 21, *a* and *b*, taken after second reduction; *c* and *d* taken after fluoroscopic reduction.

CASE 19. Figure 22, *a* and *b*, taken after one reduction attempt; *c* and *d* taken after fluoroscopic reduction, and the aid of a Spanish windlass compression.

CASE 20. This case had marked lateral displacement due to an incomplete fracture of the fibula and an epiphyseal separation and fracture of the tibia. No film was taken.

Figure 23, *a* and *b*, taken after fluoroscopic reduction.

CASE 21. This case had overlapping of 2 inches (femur). Figure 24, *a* and *b*, taken after fluroscopic reduction.

Many other illustrations could be presented but space does not permit. The above were consecutive cases that had had one or more attempted reductions by various physicians before they reached our hands.

SUMMARY

1. Fractures should be treated as emergencies.

2. Reduction, with fluoroscope if necessary, as early as possible, theoretically at least should give the best results. Economically it certainly saves time and expense.

3. It lessens the number of open reductions.

4. By this method of splint application, internal fixation material can often be omitted in open reduction cases.

5. The drawbacks to the use of the fluoroscope are the dangers to the physician and patient from over exposure to the rays and explosion of ether by open spark if the ether is not removed.

CONGENITAL FACIAL CLEFTS[1]

By V. P. BLAIR, M.D., F.A.C.S., St. Louis

MORE than half a century elapsed after the enunciation of all of the basic principles essential to the closure of the congenital facial clefts, before the palate operation was a success. The early technical results were probably as perfect as they are today, but not so regarding function.

The surgery of the lip is inseparable from that of the palate. From the more available data, a résumé of the appearance of the various essential steps would read about as follows:

According to Velpeau (21), Celsus and other ancient surgeons pared and sutured the hare-lip and made relaxation incisions on the inner surface of the cheeks. Later the art was lost and even in the eighteenth century escharotics, plasters, clamps, and bandages were still substituted for the rational technique of the ancients.

In 1825, Pointe (21), of Lyon, and Mannoir (21), of Geneva, reiterated the recommendation of Franco in 1561 that previous to the closure of the lip cleft, the posterior surfaces of the two halves of the lip be separated from the bone as far back as the cheeks.

Velpeau (21) recognized that the requisites for cure of a hare-lip are abrading of the borders, and maintenance of perfect contact. He reviewed and condemned the various types of clamps that were used to hold the lip while it was being pared.

The younger Husson, in 1836, recommended that the denuding incisions be made concave. His modification and also the flap operation described by Mirault (14), in 1844, permit of proper adjustment of the ala and floor of the nostril, and at the same time give the fullness at the lower part that reproduces the pyramidal form of the normal upper lip. Other operators have substituted an angular for the curved incision, and certain details in the Mirault operation have been changed (4), but in each of the two plans the underlying principles have stood the test of time. The Mirault type is a little more difficult, technically, but by it even the "cupid's bow" can be reproduced. The Husson type with either the curved or the angular incision is the popular operation of today, but it is apt to make an abnormally long lip. Either of these two types can be adapted to the repair of double or incomplete lip clefts. B. Bell recognized the necessity of extending the incisions up to the nostril in incomplete lip cleft.

Almost every possible kind of supplementary support, or even substitutes for sutures, have been suggested. Among the former, the quill suture which comes from a very early date, the perforated ivory plates (analogous to the lead plate suture) used by Van Onsenort, and a supplementary support of threads crossing the suture line and attached to pieces of adhesive plaster on each cheek as used by Roux are worthy of note (21).

Obturators for the closure of a cleft palate may have been used by the Greek physicians, as stated by Guillemeau, but it is an historic fact that Ambroise Paré described such a contrivance in 1541. Paré's publication, however, was antedated a few years by one Alexander Petronius. The first artificial palate was made by M. Delabarre, in 1820. According to Kingsley, the palate described, in 1841, by Dr. Stearn, of Springfield, Massachusetts, embodied the true principle that rendered available the muscles of the natural palate to control the movements of the artificial palate (11).

The earliest available record of successful repair of a cleft velum was by Lemonnier (22), a French dentist, published in 1766. Eustache (22), of Beziers, in 1784, proposed the feasibility of surgical closure of cleft palate, but no evidence was found to show that he put his idea into actual practice (22).

Dieffenbach (5), in 1834, reported first the operation for the cure of a cleft involving the hard and soft palate. It was done by liberating mucoperiosteal flaps through laterial incisions made close to the alveolar process. After freshening the cleft borders, the flaps were sutured at the mid line. Baizeau (22), in 1858, and von Langenbeck (22), in 1861, claimed originality for this operation. Today it bears the name of the latter surgeon. While neither of these two was the first to do the operation, both Baizeau and von Langenbeck helped to popularize it.

In 1842, J. Mason Warren (23), of Boston, reported several cases of cleft of the hard and soft palates cured by mucoperiosteal flaps raised and sutured without making the lateral incisions of Dieffenbach. The fact that an American, T. D. Mutter (15), in 1843, reported 21 operations on the hard and soft palate done by Warren's method, leads one to believe that Warren or Mutter had used this plan for some time before its publication

[1] It is generally believed that previous to 1834 practically all these operations were confined to the soft palate but according to Robert (1) Lemonniere's case was of a child in whom the cleft "extended from the velum to the incisor teeth." However, the technique ascribed to Lemonniere by Robert in no way reflects the broad underlying principles later utilized by Dieffenbach and Warren, and one feels that he must have been somewhat the beneficiary of beginner's luck.

in 1842. Warren's operation is now used by a number of American surgeons. Dieffenbach's, under the name of the von Langenbeck operation, is the one in more general use, and the lateral incisions, which should be made without cutting either muscles, nerves, or the posterior palatine vessels, relax the flaps and serve as convenient avenues for packing in case of persistent bleeding.

Dieffenbach in 1834 also advocated cutting the palate muscles for relaxation (5), and in 1826 (12, 6) did osteotomy of the palate process with mid line suture as a means of closing a palate cleft. Both of these procedures are usually credited to Sir William Fergusson (9, 10) who published each at a subsequent date. Billroth, in 1861 (18), substituted fracture of the hamular process for cutting of the tensor palati tendon.

Blasius (17) attempted to close a congenital cleft of the palate by a pedicle flap taken from the forehead and failed. His idea was later successfully carried out first by Thiersch (20), who in 1867, closed an acquired defect by means of a flap taken from the full thickness of the cheek, and later by Rotter (17) who, in 1889, reported a case in which he closed an anterior palate defect by a flap turned from the forehead which he had previously "Thiersch" grafted on its under surface. Kuster (13) included a part of the mucosa of the cheek with his palate flap.

E. Dudon (7, 8), of Bordeaux, credits Sedillot with the idea of the use of tapes drawn through the lateral incision for support to the palate, but Dudon used them in 1887 without suturing the freshened borders (7, 8). Fergusson passed wires around his osteoplastic flaps (10).

Adaptations, variations, and improvements have come with use, but, with one notable exception, it is doubtful if a single broad principle advantageously applicable to the unoperated on cleft of the lip or palate in the infant has been established in the past half century, and the exception noted is not related to technique. There is reason to believe that the technical results obtained by some of these earlier surgeons were quite as good as those of today. Velpeau (21) states in regard to hare-lip operations that the present practice seems to have nothing to be desired and in 1843 Mutter (15) out of 21 cases of cleft of the hard and soft palate, reported 19 successes by the Warren technique. The adjustment shown in Smith's *System of Surgery* of 1852 (19), illustrating the Mirault operation for hare-lip, appears to be quite logical, which is more than can be said of many of the operations we find illustrated since that time. It is not to be forgotten that these operations were done on children, without an anæsthetic.

The operative mortality of these operations would compare favorably with the best of today. South's (1) commentary is that "he thought the operation of staphylorrhaphy is generally unattended with danger, yet in a few instances it has been fatal." Roux lost 1 case out of 60 operated by "an inflammation spreading to the lungs and Bernard lost 1 case from pneumonia."

Our present functional success in palate operation comes not from new technical principles, but from adaptation to age.

At birth not much of the lip or palate tissue is actually missing, the width of the cleft being dependent upon a spreading apart of the two maxillæ. This was recognized by the earlier surgeons who at times used bandage or clamp pressure on the cheeks or direct pressure on the dental arches pre-operatively to narrow a cleft (21), but usually they were content to repair the lip over the cleft. This is followed by approximately normal relations of the bones, and except in the immediate proximity of the alveolar cleft, average occlusion of the teeth.

In 1861, Reeves (16), of Melbourne, advocated the very early use of a clamp on the gums to obliterate the maxillary cleft, but it is not evident that he carried out this practice. The elder Sayre discussed such a possibility in his clinical lectures.

More radical measures have not proved entirely fortunate. Lane used wide Davies-Colley flaps (2, 3) on the very young infant, while Brophy taking advantage of the pliability of the bones at this age forcefully closed the alveolar cleft and narrowed the anterior part of the palate cleft by transfixing the maxillæ with wires and twisting them over lead plates. Both of these procedures disturb at least the deciduous teeth and are apt to disarrange the permanent occlusion which we now know may be followed by very serious consequences.

The Lane operation is no more certain of success than the Warren or von Langenbeck when done at the proper age and when failure follows the primary Lane operation, re-operation is much more difficult.

Even the simple approximation of the alveolar process with a wire or suture through the bone, or the more radical plan of cutting or fracturing the process and replacing the premaxilla are followed by mal-relation of the incisor arches with flattening of the lip and increased difficulty of closing the anterior part of the palate cleft. Wiring of the maxillæ is sometimes followed by most distressing distortion and lack of develop-

ment of the upper jaw. These changes are rarely very evident in early childhood, but when seen at the age of 12 or 15 years may cause the operator almost to regret that this particular child was not one of those infants the angels had chosen for their own.

Cutting of the septum followed by overzealous replacement of the protruding premaxilla in the complete double cleft is frequently followed by results only less distressing than the catastrophe that can follow the wiring of the maxillæ. With the exception of the cutting of the septum in the complete double cleft, any and all cutting or suture of the bone is unnecessary as it is inadvisable.

The practice of simply repairing the lip over the open alveolar cleft is again becoming increasingly popular. The earlier this is done the better, though many operators prefer to wait until the child is 3 months old. In from 3 to 15 months following this operation the borders of the alveolar cleft will usually have come in contact, giving a better ultimate occlusion than can be produced by direct suture of the bones themselves.

The difficulty of preserving the normal contour of the nostril when the lip is made to bridge a wide cleft can be largely overcome by the proper application of a lead plate suture, or if the child first comes to operation after 2 years of age, the alveolar borders can be first approximated either by an orthodontic appliance as advocated by G. V. I. Brown, or by a primary repair of the palate cleft. Such mal-adjustment of the lip-nostril as does occur can be corrected by subsequent operation which is very much less true of the bone deformities that may follow wiring operation.

Among the earlier surgeons, the time of election for the palate operation was about 12 years, for at that time a desire for relief had been aroused within the patient and he was more apt to cooperate. The operation at this time improves both comfort and health, but it is usually a signal failure in one most important particular—it rarely restores normal speech. The average staphylorrhaphy done at this age might be compared to an imperfect restoration of a bottomless bucket, which makes it fit for carrying solids but not liquids; the human voice is essentially liquid. This led Kingsley, in 1879, to state that staphylorrhaphy was a failure and that mechanism was more reliable than surgery.

While at birth there is little of the normal tissue of the lip or palate missing, it is not long afterward, however, that more serious deviations become increasingly evident. One of these is the relatively shortness of the cleft velum which, failing to make contact with the pharyngeal wall, is almost entirely responsible for the "cleft palate speech."

Mutter (15) advocated early operation for both lip and palate but in this he had no following.

It was Wolf (24) in Germany, Lane, in England, and Brophy, in America, who breathed into the operation the life that brought it to its present general success. They established the fact that the cleft palate should be closed before the age of 2 years. Then the length is usually not too disproportionate and a good technical repair with subsequent training should give a fair approximation of average speech.

While the possible ill results that may follow must necessarily lead to the ultimate discard of the more radical operations, it was these same operations that demonstrated that functional results will follow the early closure of the palate cleft and this places their authors, along with Lemonniere, Malgaigne, Husson, Mirault, Warren, and Dieffenbach as among the founders of modern palate and lip surgery.

In our summing up, we should not overlook the part contributed by those professional teachers of elocution who have by gymnastics of the throat muscles done their share to improve function. Among these, Gutzmann later reversed Kingsley's judgment by concluding that the palate operated upon is a better foundation for speech training than the artificial palate.

The real problem in palate surgery before the surgeon today is a simple effectual plan of lengthening the velum, especially at the late operation. Several remedial types of operation are now being worked upon, but it would seem that, to date, none is entirely satisfactory. Correction of the mal-position of the ala and nostril which develops in the unoperated upon or the mal-operated upon lip is another problem that is now receiving attention.

NOTE.—For procuring much of the bibliography and for verifying or correcting many of the historical statements contained in the above, we are indebted to Dr. Robert Ivy, of Philadelphia.

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RUPTURE OF THE URETHRA

By JOHN H. GARLOCK, M.D., New York

THE recent observation of a rather unusual case of traumatic rupture of the urethra prompted the author to look into the subject more extensively, and there was found a decided scarcity of material in the available recent literature. We personally remember having seen at least four cases in the last 3 or 4 years, so that it is our impression that the condition is not as infrequent as some authors would have one believe. Reference is not made here to reports of injuries of a previously pathological urethra. We limit our discussion to traumatizations of the urethra in cases where pathology antedating the time of injury was presumably not present.

An interesting phase of this subject is a consideration of the etiology and the mechanics of the production of the rupture. As is generally understood, the vast majority of traumatic tears of the urethra are due to direct violence. Thus, the most common cause is falling astride some object. Under such circumstances there may or may not be a concomitant fracture of the pelvis. The fact that the pelvis is fractured, may have an important bearing on the etiology of the urethral tear. It is not difficult to conceive of a fracture of the pubis or ischium with displacement of the fragments, the irregular end of one of the fragments tearing through the urethra. Allison reports such a case in some detail. The majority of ruptures through the perineo-bulbar portion of the urethra due to direct violence are unaccompanied by pelvic fracture. The mechanism in these cases consists of the impaction of the urethra against the superimposed pubic arch, although it is Cras' belief that the bony structure involved here is the ischiopubic ramus. Dixon is responsible for the statement that practically all tears of the membranous portion are accompanied by fracture of the pelvis or dislocation at the hip, implying very plainly that the pelvic or hip injury causes the rupture. We cannot subscribe to this, inasmuch as the majority of the reported cases of rupture of the membranous urethra were unaccompanied by such injury.

In cases due to direct violence, there may be an injury to the skin and subcutaneous tissues of the perineum, with the production of what may be termed a "compound" rupture. Thus, falling astride a sharp-edged object could easily produce such a lesion.

On the other hand, injuries due to indirect violence are rare and the exact mechanics involved cannot be explained with such ease. We were able to find only one report of an authentic case of urethral rupture from indirect violence. That one is cited by Harris, but, unfortunately, is not described in detail. The case reported herewith belongs to this category. In the absence of fracture of the pelvis and impaction against the superimposed bony framework, strong muscular contraction must be considered as the important, if not the sole, factor. From a careful study of the musculature of the perineum, it would seem plausible to assume that the concerted contraction of the muscles inserting into the central tendon of the perineum could in all probability cause an urethral tear, especially if the compressor urethræ muscle acts at the same

time. Here the central tendon presumably functions as a fixed point. That, we believe to be the mechanism in the case reported.

The symptomatology is easily understood when one remembers the underlying pathology. There is pain referred to the perineum, sometimes radiating toward the glans penis. When bladder distention becomes marked, there is considerable pain in the lower abdomen. Objectively, there is usually a hæmatoma of varying size in the perineum, with ecchymosis in the scrotal and thigh regions. The resulting ecchymosis may sometimes spread over a surprisingly large area. In addition, there is usually bleeding from the meatus of the urethra, which can be accentuated by slight pressure over the perineal hæmatoma. The degree of bladder distention will depend upon how soon after the injury the patient is examined. In the great majority of instances the patient is, of course, unable to void. Occasionally, however, this is not the case. Thus, Cotton reports an instance where the patient was able to void, in spite of the fact that he was passing blood *per urethram*. In this case he assumed the presence of an incomplete tear and did not operate, as he was able to pass a catheter which he left *in situ* for 5 days. A perfect result was obtained.

In cases seen late, extravasation of urine may have already occurred. The area involved by the extravasation will depend upon the site of rupture. When the tear occurs at the junction of the perineo-bulbar and membranous segments, the urine enters the superficial intra-aponeurotic space of the perineum, passes into the scrotum and thence over the body of the pubis, between the spine of the pubis and the symphysis, into the abdominal wall by way of the scroto-abdominal passage. Owing to the density and attachments of the deep layer of the superficial fascia of the perineum, there will be little or no fluctuation. Tears of the membranous urethra will result in an extravasation between the two layers of the triangular ligament. The deep layer may rupture and the extravasation will then involve the pelvic fascia. The latter complication is fortunately infrequent. Perineal, scrotal, or pelvic extravasations of urine, when not relieved within a reasonably short space of time, invariably become infected to be followed in succession by necrosis, sloughing of the soft parts, spreading of infection and sepsis. The possibility of the development of these serious complications seems to be the strongest argument for immediate operation on any case where rupture of the urethra is suspected or diagnosed with certainty.

Ever since Toulon in 1757 first performed retrograde catheterization, there have not been any marked advances in the treatment of this injury. Toulon's case, cited by Chopart, is most instructive. A sailor was admitted to his service after having fallen astride a mast. The surgeon vainly tried to pass a sound, even after perineal incision. He then punctured the bladder and introduced a cannula. This was left *in situ*. A few days later he introduced a catheter through the cannula to the neck of the bladder and protruded it through the perineal wound. This catheter served as a guide for the sound which was passed into the bladder and allowed to remain. Three months later the sailor was discharged cured. Similar cases, involving the procedure of retrograde catheterization after preliminary suprapubic puncture, were reported by Souberbielle in 1813. Fine, of Geneva, in 1809; Gordon Buck, of New York, in 1843; Chassaignac, of Paris, in 1844; Guersant in 1847; Brainard in 1849; Giraldès in 1867. Péan was the first to perform a suprapubic cystotomy (larger wound) for this procedure. Neuber, in 1880, first passed a sound retrogradely.

A review of the more recent case reports causes considerable uncertainty as to what constitutes the most rational treatment of these urethral injuries. Irrespective of what procedure is carried out, any case presenting the symptoms of inability to void, perineal hæmatoma, bladder distention, and urethral bleeding should be considered an emergency and operated upon as soon as possible. In cases with this group of symptoms, we can only condemn any attempts at preliminary catheterization. This syndrome is almost always accompanied by either a completely divided or an almost completely divided urethra. Attempts at catheterization increase the trauma, create false pockets in the perineum, cause fresh hæmorrhage and might easily produce a complete tear where an incomplete rupture previously existed. Preliminary catheterization should be reserved solely for those cases where the patient can void voluntarily. In such instances, there is apparently very little solution of continuity of the urethra. Successful catheterization here, of course, makes operative interference unnecessary. Cotton's case belongs to this group.

When considering the actual operative procedure, we do not believe it advisable to advocate a single method and make it applicable to every case. Thus, Harpster recommends preliminary suprapubic cystotomy. When the patient's general condition has improved, he then performs

perineal section. At the French Surgical Congress of 1910, Marion declared that preliminary diversion of urinary flow was absolutely indicated in urethral rupture. In contradistinction to this view, Allison maintains that suprapubic drainage is rarely indicated and should be used as a last resort for the sole purpose of performing retrograde catheterization.

After reviewing the various procedures advocated by a number of writers, we feel that a plan of action such as the following will result in a decrease in operative shock, a smoother and shorter convalescence, and better end-results. The first step, then, consists in making a vertical incision in the midline over the perineal hæmatoma. The blood clot is evacuated and all bleeding points ligated. It is sometimes exceedingly difficult to ligate the divided branches of the internal pudic vessels. A sound is then passed and the distal end of the torn urethra is located. An attempt is now made to locate the proximal end. It is desirable to carry out this procedure with great care and respect for the perineal tissues, inasmuch as false passages are very easily created. If the proximal end cannot be found after a reasonable search, the following manœuvre should be carried out. An assistant is instructed to apply constant gentle pressure over the bladder, and the surgeon, after thoroughly drying the operative field, watches for a trickle of urine in the lower part of the wound. Its point of exit marks the location of the proximal end of the urethra. This procedure was tried in the case herewith recorded, but without success, possibly due to the fact that it was difficult to obtain a perfectly dry field. If this manœuvre proves unsuccessful, the next step consists in performing a suprapubic cystotomy, primarily for bladder drainage, and secondarily for retrogade catheterization. If the patient's condition warrants it, retrogade catheterization can be performed at the first operation. The proximal end of the urethra is then easily located and sutured to the distal end over a large retention catheter. If the patient's condition is not good, it is advisable simply to drain the bladder and, 36 to 48 hours later, perform retrogade catheterization and urethral repair.

There are a few important points in the after-care of these cases that bear emphasis and repetition. The suprapubic and perineal wounds should be kept as clean as possible. Toward this end, it is advisable to change the dressings two or three times daily for the first few days after operation. We have found that tightly packing the suprapublic wound with vaseline gauze reduced the urinary overflow into the dressings to a minimum. In uncomplicated cases there ought not to be any seepage of urine through the perineal wound. Occasionally this occurs during the first 2 days after operation, but gradually stops without interference.

Another important phase in the after-care is the early institution of bladder irrigations. These should be repeated every 4 hours and given through the retention catheter, the washings passing out through the cystotomy tube. Sterile boric acid solution is most commonly employed. Only by these frequent irrigations is it possible to keep both tubes and the bladder clear of mucus and deposits of urinary salts. At the same time the chances for infection are greatly diminished. Of course, hexamethylenamine and, if indicated, acid sodium phosphate are given at regular intervals during the patient's convalescence.

As regards the time for removal of the retention catheter and the cystotomy tube, we believe each case should be judged individually. Where convalescence is smooth and the perineal wound is dry, the retention catheter can be removed on the ninth or tenth day. Allison left the retention catheter in place for 21 days, in spite of the fact that the perineal wound never leaked any urine. The suprapubic tube can be removed, 2 or 3 days after the indwelling catheter is dispensed with. As soon as the catheter is removed, the patient is encouraged to void voluntarily. The daily passage of sounds is instituted immediately, beginning at first with a No. 10 or No. 12 F. and gradually increasing the size. After the patient's discharge from the hospital, sounds must be passed at regular intervals, extending over a period of 6 to 10 months.

In tabulating end-results, anatomical, economic, and symptomatic factors must be considered. An analysis of the reported cases in the literature brought out the fact that very little attention was paid to economic and symptomatic end-results. Des Vignes and Larmande in the French literature have gone a little more fully into these questions. The economic factor, i.e., how soon a patient is able to resume his occupation and whether there has been any intereference with his earning capacity, we cannot enlarge upon inasmuch as very little has been reported. From the symptomatic standpoint, it is interesting to note that some of these patients complain of pain in the perineum, more noticeable during the act of micturition and lasting 6 to 12 months after the operation. If a stricture has developed, the accompanying symptoms of difficulty in voiding,

change in the caliber of the urinary stream, retention, etc., will be noted.

The question of anatomical end-results calls for a consideration of the presence or absence of stricture. There seems to be a concensus of opinion as to the advisability of passing sounds at regular intervals for a considerable time after operation. However, a careful study of some reported cases seems to bear out the old contention that, even in cases where regular passage of sounds is not practiced, stricture is less liable to follow a healed traumatism than a healed Neisser infection. The majority of the reported cases have been followed for 2 to 12 months with excellent anatomical end-results in a large percentage.

J. L., age 34, white, truckman by occupation, was admitted to the surgical service of Dr. Benjamin T. Tilton, at St. Mark's hospital, June 27, 1922, with the following history: Three hours before, he fell backward from the tailboard of a wagon to the ground, a distance of 3 feet, and landed on the broad of his back. As he was about to stand up, he saw a case of goods falling toward him, and, raising his right leg, kicked out strenuously against the falling object. He missed the case which fell harmlessly to one side. He stood up and proceeded with his work. Ten minutes later he began to experience pain in the perineum, accompanied by a desire to urinate. Instead of passing urine, he voided blood. On admission, he complained of pain and swelling in the perineum, inability to void, and bleeding from the urethra.

Examination, one half hour after admission, showed a well-developed, well-nourished male adult who complained of a constant desire to urinate. General physical examination was negative. By palpation and percussion, the bladder was found distended midway to the umbilicus. There was nothing to point toward intraperitoneal injury. There was a swelling in the perineum measuring 5 centimeters in diameter with ecchymosis over the entire perineum and lower half of the scrotum. There was free bleeding from the urethra, accentuated by slight pressure over the hæmatoma. No attempt at catheterization was made. Temperature 98° F., pulse 86, respiration 20.

Operation was performed immediately. Dr. J. H. Garlock. Under ether anæsthesia, a vertical incision was made in the midline over the perineal hæmatoma and the blood clot was evacuated. Three divided branches of the internal pudic artery were ligated with great difficulty. A sound was passed and the distal end of the torn urethra was easily identified, showing a raggedly torn edge. A search was then instituted for the proximal end. It could not be found. The procedure of gentle pressure over the bladder and watching for a trickle of urine, was unsuccessful. The perineal wound was packed with plain gauze and a suprapubic cystotomy was next performed, suturing a large cystotomy tube to the wound. Retrograde catheterization was not performed at this operation inasmuch as we felt that the patient's condition did not warrant it.

On the following day there was a bloody discharge from the perineal wound with marked scrotal ecchymosis. The cystotomy tube was draining freely. Temperature 100° F., pulse 100.

On June 29, 1922, 48 hours later, the second operation was performed. Dr. Benjamin T. Tilton. Assistant Dr. J. H. Garlock. Under gas-oxygen anæsthesia, the perineal wound was enlarged somewhat and the distal end of the torn urethra again identified. The cystotomy tube was removed and retrograde catheterization performed with a No. 22 F. sound. The proximal end was found greatly displaced from the midline toward the left and covered by torn muscle fibers, probably part of the compressor urethræ muscle. The tear had occurred at the junction of the perineobulbar and membranous portions of the urethra. It was then a simple matter to suture the divided ends over a retention catheter, size No. 24 F. No. 1 chromic interrupted catgut sutures were used, an attempt being made to obtain as accurate an approximation of mucous membrane to mucous membrane as possible. The perineal wound was packed with iodiform gauze and the cystotomy tube sutured back in place.

The patient showed a marked postoperative reaction with rapid feeble pulse and rise in temperature to 102° F. In 6 hours, after vigorous therapy, he had recovered from this surgical shock.

June 30. Both tubes draining freely. Perineal wound clean. Bladder irrigations started, using sterile boric acid solution. These were given every 4 hours through the urethral catheter, the washings passing out via the cystotomy tube. Temperature 101.8° F., pulse 110.

July 1. Condition satisfactory.

July 3. Mild superficial infection of the cystotomy wound. Perineal wound clean. Suprapubic wound packed with vaseline gauze to decrease the amount of urinary seepage around the cystotomy tube. Plain gauze packing in perineal wound.

July 5. Large cystotomy tube replaced by a smaller one. Superficial infection of wound. Perineal wound clean and granulating. There has been no evidence of urinary drainage from the perineal wound. Retention catheter draining. X-ray examination of pelvis negative for fracture. Urine: specific gravity, 1020; alkaline; very faint trace of albumin; few pus cells and some epithelial cells on microscopic examination.

July 10. Perineal wound practically healed. Retention catheter removed. No. 12 F. sound passed easily. Patient was urged to void voluntarily.

July 11. No. 20 F. sound passed without difficulty. Patient voided few ounces voluntarily today.

July 12. Cystotomy tube removed. No. 22 F. sound passed without meeting obstruction.

July 15. Condition satisfactory. Very little urinary discharge from suprapubic wound. Urine: specific gravity, 1008; alkaline; trace of albumin, few pus cells and many bacteria on microscopic examination.

July 17. Perineal wound healed. Suprapubic wound healing rapidly. Patient has been voiding since July 12. No. 24 F. sound passed. Urine: specific gravity, 1015; acid; trace of albumin; pus cells and bacteria.

July 19. Under local anæsthesia, meatotomy was performed in order to allow for passage of sounds of larger size. No. 28 F. passed without difficulty.

July 21. No. 28 F. passed easily. Suprapubic wound practically healed.

July 22. Urine: specific gravity 1016; acid; very faint trace of albumin; scattered white blood cells.

July 26. Discharged from hospital. Both wounds were healed and a No. 28 F. sound could be passed without meeting any obstruction.

Follow-up notes: The patient continued taking hexamethylenamine for 3 weeks following his discharge. Sounds were passed every 2 weeks for 2 months, at the end of which time a No. 30 F. was passed without difficulty. From then on sound therapy was continued regularly once a month. The urine has remained completely negative. For 3 months, the patient complained of an occasional

sharp pain in the bladder region especially in the scar of the cystotomy wound. This gradually disappeared. Now, 7 months after the accident, he complains of occasional pains in the perineum, more noticeable during the act of micturition. This is gradually becoming more and more infrequent in its occurrence. Following the operation, and the hospital convalescence, the patient gained 10 pounds in weight and resumed his regular occupation at the end of September, 1922, 3 months after the accident.

We thought it would be of considerable interest to obtain a direct visual picture of the mucous membrane in the region of the urethral tear. An urethroscopic examination was made by Dr. J. H. Friedman, whose findings were unusually interesting. There was nothing pathological found anywhere in the urethral canal distal to the verumontanum. There was no scar formation running in a transverse direction nor any interference with the caliber of the lumen. Just proximal to the verumontanum, and running in a longitudinal direction along the floor of the urethra was a linear slightly raised thickening of the submucus tissues. In view of the fact that the urethral rupture had occurred about 2 centimeters distal to this point, this abnormality most probably represented some anatomical anomaly. This examination was made 7 months after the inception of the injury. In the absence of any scar tissue formation at this late period, we have every reason to suppose that the anatomical end-result in this case can be marked: good.

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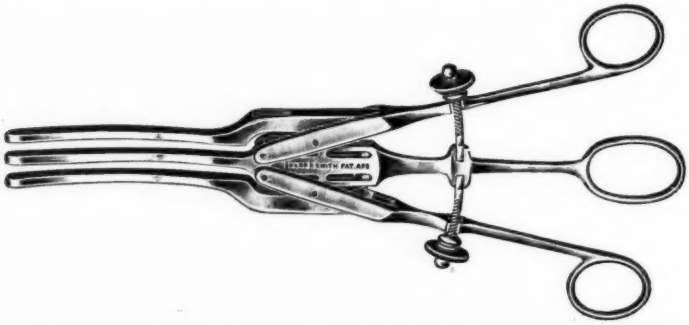
A NEW GASTRO-ENTEROSTOMY CLAMP

By C. A. ROEDER, M.D., F.A.C.S., Omaha, Nebraska

IN the technique of gastro-intestinal anastomosis, a parallel approach of the blades of the clamps used to approximate the two segments to be joined is most essential. The three bladed clamps of Linnartz and Roosevelt have simplified the technique beyond the use of the two separate forceps held together by assistants or by additional instruments. The disadvantage, however, of these three bladed, as well as all other clamps, is that unequal pressure is exerted on the stomach and intestine at the proximal and distal ends; when sufficient pressure is obtained to hold the stomach and jejunum in proper approximation at the distal end, the resulting pressure at the proximal end is too often injurious to the walls of the segments involved. A proper clamp will always be desirable in performing a gastro-enterostomy to eliminate contamination and hæmorrhage.

The clamp illustrated is designed with the idea of parallel approximation of three blades and it meets every requirement for performing a short loop gastro-enterostomy, exerting equal pressure at the proximal and distal ends. Because equal pressure is produced, only very thin rubber covering is required, and it is now necessary for the rubber to act merely as a friction surface, as a cushion is not necessary. With other styles of clamps heavy rubber tubing is required to prevent injury to the walls of the stomach and jejunum.



This clamp should be kept thoroughly oiled to prevent too much play in its mechanism and should be boiled occasionally in a weak soda bicarbonate solution to keep its mechanism clean.

CORRESPONDENCE

A CASE OF "APOPLEXIA GLANDULÆ THYREOIDEÆ"

THE case described by Green in the August, 1922, issue of SURGERY, GYNECOLOGY AND OBSTETRICS is similar to one which came under my observation and I believe is worthy of being reported. The beautiful plates that accompanied Green's article reminded me of my case which showed an analogous local discoloration of the skin on the upper part of the body.

This patient came under my notice in 1893 in Poltava, a town in southern Russia. An old German lady of 65, the wife of the late Dr. Meyer, the physician of the College for the Ladies of Noble Birth, was suddenly taken ill on her return home from the railway station, whither she had accompanied her son who was leaving her for several years. This parting caused her great grief and she sobbed violently. She sat down to dine and found to her great terror that she could swallow neither food nor drink as it refused to pass her throat.

I was called to see her 8 hours after she was taken ill and I found several physicians in consultation, all anxious to do their best for a person so highly esteemed, and all puzzled by the mysterious nature of the illness, the cause of which they were unable to explain. It was midnight, the patient could not lie down, but had to be propped up in a half-sitting position. She was paler than usual, and the lower part of the neck was somewhat swollen but not to any very great extent. She drew my attention to the fact that her collar seemed to have grown tight in so few hours and made her feel uncomfortable. She was quite conscious. The pulse and the temperature were normal, she felt no pain, but she was frightened at not being able to swallow even a drop of water. Whatever she took into her mouth, was regurgitated through her mouth or through the nose. The act of bending her head in any direction caused her great distress. Upon examining her throat I found that the two lateral tonsils and the soft palate, especially the uvula, were as white as paper and formed a strong contrast with the normal rosy color of the mucous membrane of the gums, of the tongue, and of the inside of the cheeks. Upon touching them I did not experience any sense of resistance, but, on the contrary, the mucous membrane was soft, flabby, and somewhat swollen. The only abnormal symptom to be noticed was the painfulness of the isthmus of the thyroid gland which in her case had always been double its normal size, for in the neighborhood of Poltava, owing to the marshy river Worskla, many women suffer from goiter. Mrs. Meyer had not hitherto shown evidence of this complaint. She refused to have a stomach tube or œsophageal sound introduced into her stomach. As there were so few symptoms, my colleagues and I could not agree on the diagnosis, and it was not until the next morning, when we noticed the swelling of the lower part of the neck and especially the swelling of the whole throat at the back, that it occurred to me that some obstacle must have suddenly arisen under the fascia profunda colli. Using this as my hypothesis I expressed an opinion that one of the larger arteries of the neck

Fig. 1. Drawing showing patient on tenth day of the disease when extravasation of blood was at its height.

lying under the fascia profunda colli must have burst.

One could not observe any symptoms of sclerosis in the extremities, but the arteries of the temple were lengthened and somewhat hardened, yet one could feel the pulse, which proved that both carotid arteries were normal. It could be surmised that one of the branches of these arteries had burst. Which then? My supposition was that is was one of the four thyroid arteries and if that were so, a hæmorrhagic spot on the skin in the jugulum sterni would appear in due course. And, indeed, 50 hours after the beginning of the trouble two dark spots did appear above the jugulum sterni, on either side of the middle line of the neck. The location of those two small spots seemed to indicate the points of the exit of the two external jugular veins through the fascia to the deep jugular veins. It became clear to me then that the blood that was discharged under the deep fascia of the neck had profited by the two spaces close to the two jugular veins to show through them under the skin. I predicted then that this extravasation of blood would spread widely on the chest and on the neck. My prediction came true in a manner unique in my experience.

The accompanying diagram may give an idea of the size of the extravasation of the blood. These symptoms appeared in a few days' time in this succession: during the first 5 days the discoloration spread over the neck and the upper part of the chest and toward the tenth day extended to the line indicated on the picture.

The symptoms of dysphagia disappeared gradually soon after the appearance of the discoloration of the skin. At the same time I noticed that the mucous membrane of the throat regained its normal color. Soon the patient was well again and to my great joy I had not the opportunity of verifying my hypothesis by the means of an autopsy. I have been waiting for 30 years for a similar case, but in vain, and only the case presented by Dr. Thomas Green induced me to describe the case of Mrs. Meyer.

In my practice as a surgeon I have seen many cases after "strumectomia" where the extravasation of blood extended as far as the chest but never to such extent.

In German literature I have found only two cases somewhat analogous, one of which concerns a girl who was stabbed in the thyroid gland, but the extravasation was of somewhat smaller size. This case was described about 30 years ago in the *Deutsche Zeitschrift fuer Chirurgie* and was illustrated by a very good diagram.

JOSEPH CASIMIR VON ZIEMACKI,
Professor of Surgery.

Vilna, Poland.

EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

FRANKLIN H. MARTIN, M.D. ..... Managing Editor
ALLEN B. KANAVEL, M.D. ..... Associate Editor

OCTOBER, 1923

COLOSTOMY; A PRELIMINARY MEASURE IN RESECTION OF THE DISTAL COLON FOR MALIGNANCY

SEGMENTAL removal of the colon for malignancy in any of its divisions is a formidable manœuvre, the mortality of which is influenced not so much by its technical difficulties as by the toxæmia and dehydration which accompany obstructive lesions of the large bowel. The technical difficulties which arise are chiefly limited to the left half and are mainly due to the immobility of this segment caused by its shortened mesentery or by attachment to adjacent vital organs, or by perforation or abscess formation. The uncertainty of the distribution of the normal blood supply of the distal colon is an additional factor which renders more hazardous its attack by surgery than that of the proximal half.

The distal colon, because of the nature of its contents, as well as the increased difficulties of surgical attack, is less advantageously removed in one stage, even when no obstruction is present, than its fellow of the opposite side. Obstruction even of a very moderate degree tends to make the bowel wall œdematous and soft, and consequently increases the danger of perforation following resection and restoration of the continuity of the lumen. The bacterial flora normally present becomes most active under obstructive conditions, and in devitalized and dehydrated individuals, whose already lowered resistance is severely taxed, any infection even of a low grade is liable to result fatally.

Stiles is inclined to advocate preliminary colonic drainage in all cases of carcinoma of the colon beyond the hepatic flexure and is one of the stanchest advocates of a graded operation. Cæcostomy as performed by him in all these cases is a procedure well worthy of consideration and acceptance. Cancer obstruction generally is subacute for a considerable time before it completely occludes the bowel lumen and, with the possible exception of hæmorrhage, is the most frequent cause of medical advice being sought.

Unhappy experience has taught the dangers and high mortality of an attempt at a complete resection in the face of total obstruction and the inclination, at present, to consider obstruction of any degree a contraindication to radical operation is gaining vogue. The anæmia which is an almost constant accompaniment of colonic carcinoma and which so frequently is seen to occur without loss of blood, is a primary reason for placing these cases of any length of standing in the category of grave surgical risks. Dehydration and toxæmia which accompany the absorption of the poisonous products of the obstructed bowel add to the risk of operation so materially that in many cases the pre-

operative preparation demands that they be combatted by transfusion of blood and by forcing the fluid intake.

Several years ago W. J. Mayo pointed out that the attempts to increase the limits of operability in malignant disease of the colon resulted in a rapid and marked increase in the mortality percentage because of the acceptance for surgical intervention of bad risks, which had hitherto been excluded. That this was justified was made plain where it was shown that out of each 100 cases operated upon, more patients were alive at the end of a given number of years than in the other group which attacked only movable growths without demonstrable metastasis. Operative procedures which are feasible must not only offer the patient a reasonable chance for ultimate cure or at least a prolonged palliation, but they must do so with a reasonable death rate. Radical attempts at extirpation at a single stage by any of the recognized technical methods of resection and end-to-end anastomosis, or over a tube, or by the combined abdomino-perineal route can in many instances be replaced by a graded operation without sacrifice of thoroughness and with a lower mortality because the local and general condition of the patient has improved.

Operations of the Mikulicz-Burns type are safe and in the main satisfactory. Because this operation does not contemplate the opening of the bowel lumen until the peritoneal cavity has been sealed off by adhesions, it is attended with an extremely low mortality, and it is applicable to most growths at the rectosigmoid junction as well as in the sigmoid and descending colon. At the end of 48 hours, if obstruction is marked, it is possible safely to excise the tumor mass which has been brought out on the abdominal wall, thus converting the operation into a delayed colostomy. One criticism leveled at this operation is the prolonged convalescence which is necessary and, in addition, that there is a definite percentage of recurrences in the abdominal wall.

Rarely can one promise the patient that the convalescence following this type of operation will be completed within less than 3 months. Generally attempts to hasten the closure result unfortunately, the infected and thickened wound edges being slow of union and refusing to heal with any degree of promptness.

A colostomy, cæcostomy, or ileostomy followed within a short time by radical removal of the malignant segment offers perhaps as high a percentage of cures and as reasonable mortality as any of the manœuvres now being practiced. The advantage of this method is twofold: first, it permits of exploration; second, the immediate relief of obstruction by reduction of toxæmia permits a second extensive operation upon a patient whose resistance has been increased by the drainage and supportive measures subsequent to it, and therefore is a less hazardous risk. The second stage of operation may be as radical as the choice of the operator dictates. There is no increased difficulty in performing the resection because of the presence of the colostomy, and the chances of union at the site of anastomosis are markedly increased. With the colostomy above the anastomosed bowel, the hardened fæces are diverted from passing over the suture line and its ultimate healing is insured. The difference in blood supply, in different individuals and in different segments of the colon makes primary union following resection of the left half uncertain enough to necessitate abdominal drainage in all cases from fear of leakage. With the bowel cut off above the suture line by colostomy, the inactive lower segment rarely fails to heal readily, even though in a small

number of cases pelvic abscesses have been found to form. The two types of operative procedure which have been found especially advantageous as preliminary colostomy are: first, a modification of the Mixter method; and, second, the Maydl-Littlewood type. The left rectus colostomy is entirely satisfactory either as a temporary or permanent procedure, but it should be remembered that occasionally a loop of small bowel slips to the outer side of the proximal colon and becomes obstructed. This is obviated by making the colostomy well out in the groin and by placing a few interrupted sutures between the outer leaf of the colonic mesentery and the parietal peritoneum, thus closing any opening through which any small bowel can herniate. The colostomy may be opened any time after 48 hours but it is well to allow patients to go for at least 7 or 8 days if the gas distention is not too troublesome.

Colonic irrigation of both segments distal and proximal to the colostomy is advisable to cleanse the lower segment for subsequent operation and to reduce the toxæmia already present by emptying the contents of the proximal division. In making the second stage resection, it is advisable to approach the growth through a mid-line incision. Attempts to do the operation through an incision to the outer side of the colostomy will be found to be more difficult.

Whatever the operative procedure finally determined upon, a most vigorous attempt to increase the vitality of the individual should be undertaken by strenuous pre-operative attention to overcoming the devitalization, incident upon the toxæmia, anæmia, and dehydration, which the majority of these patients present.

With this in mind it seems feasible that a graded operation which permits of exploration and a later resection without sacrifice of thoroughness, but with a lower mortality, should warrant more extended usage.

FRED RANKIN.

EXPLORATORY INCISION VERSUS PARACENTESIS IN ASCITES

IN practically all cases of ascites it is a simple matter to obtain the patient's permission to remove the accumulation of abdominal fluid by tapping, but consent to perform an exploratory laparotomy under local or gas anæsthesia may be more difficult to obtain unless some distinct advantage of the procedure can be explained to the sufferer. In reviewing some old case histories, I have been impressed with the large amount of knowledge gained and the very small harm done by a 3 inch incision under local anæsthesia, and, where indicated, the performance of an omentopexy as suggested by Narath.

Palpation is undoubtedly a very satisfactory aid to diagnosis, and organs or tumors can certainly be more successfully palpated if the abdominal fluid is withdrawn. Granting this, it is logical to assume that the investigation will be even more successful if, after the fluid is withdrawn, palpation and inspection are resorted to through an abdominal incision. Cytological examination of the fluid withdrawn by tapping may demonstrate carcinoma or tuberculosis, especially the latter after guinea-pig inoculation, but when exploration is done through an abdominal incision, tissue may be removed for histological examination, and the diagnosis will be correspondingly more exact.

There are those who argue against the procedure on the ground that it causes surgical shock or trauma, and who classify it as another "unnecessary operation." No operation that establishes a diagnosis and indicates

treatment can be called unnecessary, and in the hands of a competent surgeon the procedure is devoid of any serious risk. In a rather large experience, the writer has never seen any untoward effects. Naturally anatomical knowledge, skilled technique, and careful asepsis are taken for granted, and in addition it must be emphasized that it is wise not to allow any of the intestinal mass to escape onto the abdominal wall. The distended coils are difficult to replace, and the extra manipulations necessary may cause nausea and vomiting, thereby increasing the difficulty of the operation under local anæsthesia. Again, adhesions may be torn, causing annoying hæmorrhage, and the diseased bowel, which is often very friable, may even be torn. Every factor for the patient's safety must be taken into consideration if this procedure is to give us the results we desire, and the observance of this point in technique will save embarrassment and add to the patient's comfort, and to the ease of his recovery.

On the other hand, there are some dangers to be mentioned in connection with paracentesis. While such accidents as hæmorrhage from injury to a blood vessel or puncture of the bladder are infrequent, they must be borne in mind and guarded against. Tapping an ovarian cyst or similar growth complicates its subsequent removal, and may be fraught with immediate danger. We must remember, also, that in many instances tapping is merely a temporary measure of relief, that it often leaves us no wiser than we were before as to the condition to be dealt with, and that valuable time may be lost, and even the chances of a cure through operation thrown away while this procedure is being tried and ultimately discarded.

As Dock[1] in his classical paper notes, the exploratory incision reveals not only the presence of cancer or other pathology, but the extent of the disease and the possible measures of relief. All operators are familiar with cases in which the first manifestation of trouble to which the patient attached any importance was ascites. Very often it is the first symptom of malignant disease, and it is a frequent symptom in curable pelvic conditions. In a recent instance I advocated an exploratory incision in a patient who had been tapped without result other than the purely temporary relief consequent upon the withdrawal of the fluid. The condition was thought to be a simple cirrhosis of the liver, and only when tapping and free catharsis failed to relieve was the exploration permitted and the true condition learned. At operation I found a large pelvic neoplasm, with liver metastases, for which, of course, nothing could be done. An earlier exploration might have given a very different result. Dock illustrates his argument by citing several cases where curable pelvic conditions were found at operation, when several previous tappings had been done with no permanent benefit. His list includes one dermoid cyst of the ovary, one fibroid tumor of the uterus, and several cases of tuberculous peritonitis, cancer of the stomach, etc. To these I would add several cases of tuberculous peritonitis in my own practice, one non-parasitic cyst of the liver, and one echinococcus cyst.

We must admit that paracentesis has a field of usefulness in certain inoperable conditions, and, to some extent, as a diagnostic aid, but its field is limited, and I would make a plea for more frequent exploration through a suitable incision under local or light general anæsthesia. This can be done without risk to the patient, and frequently with distinct benefit.

Ascites is a convenient term in general use, and may cover a wide variety of con-

[1] Internat. Clin., S. 2, ii.

ditions. Some of them may be curable and pass unnoticed until too late, others may be already inoperable, and most of them are likely to be difficult or even impossible of recognition merely by history and physical examination, however careful and painstaking. In all such cases the underlying pathology will be rendered less obscure and the patient's chances of complete or partial relief materially improved if exploratory laparotomy is substituted for simple paracentesis.

URBAN MAES.

GENERAL GORGAS

A SERIOUS movement is under way to honor the great soldier-doctor, William Crawford Gorgas. If you are interested in this project you are invited to read the brief biographical sketch on pages 546 to 558 of this issue, and to peruse advertising page 45, on which appears the summary of a plan that has been formulated to provide a working institute that will honor the memory of General Gorgas in the manner that would have pleased him. F. H. M.

MASTER SURGEONS OF AMERICA

WILLIAM CRAWFORD GORGAS

MAJOR GENERAL WILLIAM CRAWFORD GORGAS was an international character and his professional career, medical and military, included accomplishments of supreme importance, involving responsibilities that brought to him enduring fame.

In this brief sketch of his life, it is the purpose to bring out only a few of the salient points of his remarkable career which will serve to illustrate his character, and particularly to bring to light a few unknown facts about his labors as Surgeon General of the United States Army during the World War.

I. BIOGRAPHY

William Crawford Gorgas was born in Mobile, Alabama, on October 3, 1854. He was the son of General Josiah Gorgas, the chief of ordnance of the Southern Confederacy during the Civil War, and later the president of the University of the South, at Sewanee, Tennessee. Gorgas was graduated from the University of the South with the degree of A.B. in 1875, and from Bellevue Hospital Medical College with the degree of M.D. in 1879. He entered the Medical Department of the United States Army on June 16, 1880, as first lieutenant, was advanced to captain in 1885, and to major in 1898.

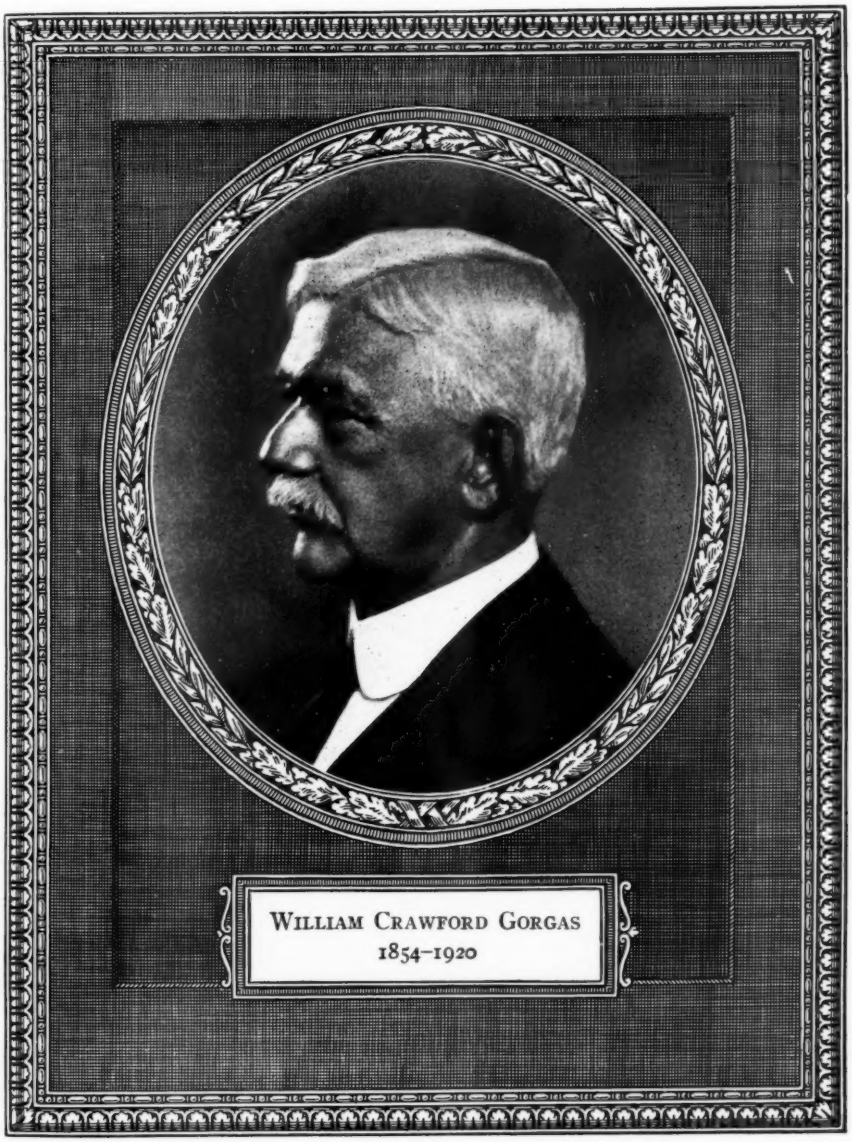
In 1880, yellow fever was prevalent in Brownsville, Texas, in violent epidemic form. Conditions were bad beyond the power of words to portray to those who have no recollection of conditions in a yellow fever stricken city prior to 1880. The government as well as the people at large had been appealed to.

General Gorgas, with the rank of lieutenant, was sent to Fort Brown, near Brownsville, to assist in the medical care of the civilian population. There he first met Miss Doughty, later Mrs. Gorgas, who then was seriously ill of yellow fever, and there he contracted the disease also.

Later, Gorgas was in active service in Florida, in the West, in Dakota, and in the old Indian Territory.

He accompanied the military expedition against Santiago in 1898. Fate, possibly with a purpose, visited his system with yellow fever in early life, thereby making him immune to the disease. Because of his practical knowledge of yellow fever, he was appointed chief sanitary officer of Havana, which post he occupied from 1898 to 1902.

It was in 1900 that Gorgas was in close contact with the investigation that was being conducted in Havana by the Walter Reed Board, the purpose of which was to determine the course of yellow fever. The memorable discovery



WILLIAM CRAWFORD GORGAS
1854–1920

made by this board revealed the cause thereof; but it was Gorgas who applied these principles and effected the eradication of yellow fever from Havana.

In 1904, Gorgas was appointed chief sanitary officer of the Panama Canal Zone, and in 1907 he was made a member of the Isthmian Canal Commission. In recognition of his work in Havana, his rank was increased to that of colonel by a special act of Congress in 1903, and he became assistant surgeon general of the United States Army. In 1915, Gorgas and his associates on the Isthmian Canal Commission received a vote of thanks from Congress for distinguished service rendered in connection with the construction of the Panama Canal.

In 1913, General Gorgas went to Rhodesia, South Africa, at the invitation of the Chamber of Mines, Johannesburg, to advise as to the best means of preventing pneumonia and malaria among the native mine workers. He was appointed surgeon general of the United States Army, with the rank of brigadier general, on January 16, 1914, and was given the rank of major general in 1915. He served with great distinction as surgeon general during the trying period of our participation in the World War, until his retirement on account of age on October 4, 1918.

He never lost his interest in world sanitation. While he was stationed in the Canal Zone, he visited Guayaquil, Ecuador, and mapped out a plan for the control of yellow fever in that disease-ridden district. In 1916 he was made chief of the special Yellow Fever Commission of the Rockefeller Foundation, and spent several months in South America making surveys and laying plans for the eradication of yellow fever from localities in which it still prevailed.

After his retirement as surgeon general, he immediately accepted the assignment to direct the yellow fever work which had been undertaken by the International Health Board of the Rockefeller Foundation. On May 7, 1920, he sailed for England, en route to West Africa, where he was to investigate the yellow fever situation. He fell ill in London on May 30, 1920, and died on July 4, 1920.

II. CHIEF SANITARY OFFICER OF HAVANA

1. *Preliminary Investigation of Course of Yellow Fever*

Many names have become historical in connection with the preliminary work which was pursued to demonstrate the course and means of transmission of yellow fever. Dr. Walter Reed, who was at the head of the sanitary board that finally succeeded in working out in detail and demonstrating the course of this disease, said of one of these early workers: "To Dr. Carlos Finlay, of Havana, must be given, however, full credit for the theory of the propagation of yellow fever by means of the mosquito, which he proposed in a paper before the Royal Academy in that city at its session on the 14th day of August, 1881."

It was not until 1899 that the then Surgeon General Sternberg, of the United States Army, who was one of the leading bacteriologists of the profession and also one of the leading known authorities on yellow fever, induced the secretary

of war to appoint a board of army medical officers to investigate the entire subject of yellow fever. This board consisted of Doctors Reed, Lazear, Carroll, and Agramonte, and proceeded with its investigations in Havana, where General Gorgas was stationed at the time as chief sanitary officer. Necessarily, Gorgas had much contact with this board and with its individual members. The Sanitary Department of Havana had a commission of medical men to whom all cases of yellow fever were referred for diagnosis. This commission was comprised of General Gorgas, Dr. Carlos Finlay, Dr. Antonio Albertini, and Dr. Juan Guiteras, and co-operated closely with the Walter Reed Board. This board, of which General Gorgas speaks as "this now famous and immortal board," completed its comprehensive investigations and presented its findings or conclusions early in 1901.

2. *Findings of Walter Reed Board*

Gorgas looked upon the discovery of the Walter Reed Board with the eye of an appraiser. He had watched the process of its development, and by his knowledge of the subject, he judged of its value and was convinced that the experiments of the board left no doubt of the reliability of its claims.

Yellow fever was caused by a germ that was transmitted to men by the bite of a female stegomyia mosquito. This mosquito must first bite a yellow fever patient after the third day of the onset of the disease. Within the period of from twelve to twenty days after biting the yellow fever patient, the mosquito was able to transmit the disease to a non-immune individual. This was the theory furnished by the scientists, which Gorgas pondered over and which made him realize that to him had come the opportunity to utilize it in controlling or eradicating yellow fever.

3. *Eradication of Yellow Fever*

With these facts before him, he plainly saw that yellow fever could be eradicated if no yellow fever victims were bitten by a stegomyia mosquito after the third day of the disease. It was likewise obvious that yellow fever could not develop if a female stegomyia mosquito that had bitten a yellow fever patient did not bite a non-immune individual within the period of from twelve to twenty days afterward. Therefore, if a patient having yellow fever were isolated to the extent that no mosquito could bite him, there could be no transmission of the disease from that patient.

His direct working mind had this material as a basis. He foresaw that he must eliminate all traditional, irrelevant notions about the development of yellow fever, and concentrate on this new theory that he was convinced was true. First, then, he must, so far as possible, destroy the stegomyia mosquito; second, he must screen all victims of yellow fever so as to prevent them from being bitten by mosquitoes that would transmit the disease; and, third, he must screen all non-immune individuals against the bite of the stegomyia mosquito. How simple!

But he had the traditions of ages to combat, and he had to deal with thousands of people of a great city, few of whom knew anything of science, and to whom it would be difficult to explain his problem. Then, too, there was the medical profession itself, which is too often too slow in adopting new theories which are established by scientists. He had to re-educate society and change its attitude toward the control of disease, supplanting the traditional teachings of years, that the disease was caused by filth, miasma, night air, and contagion through personal contact, with the new theory of mosquito propagation. He had before him the problem of discovering a method of destroying the mosquito where every condition existed which was most favorable to its development. He had to supervise the care of sick individuals who must be served by trained assistants who believed in and understood the work in which they were engaged. Those people whose houses had to be ridded of mosquitoes had, necessarily, to be put to great inconvenience and expense. A government had to be convinced that past methods, in the pursuit of which it had spent vast sums of money, were all wrong, and that it must appropriate sufficient funds to make possible a trial of the new theory.

But his enthusiasm, his staunch belief in his proposed methods, his immediate initiative, and his great industry overcame all obstacles, and between the time of the announcement of the plan on February 1, 1901, and September 15, 1901, a period of less than eight months, he eradicated yellow fever from Havana, where it had continuously existed for over 150 years.

4. Malaria Control

The plan followed to rid Havana of yellow fever, with its resultant destruction of the stegomyia mosquito, also destroyed the anopheline mosquitoes which propagate malaria. The result of this work was to reduce malaria in a most marked degree. Before 1901, Havana, dating back to 1872, had an average yearly death rate from this disease of over 300; in 1898 it rose to 1,900. Since 1901, after the systematic destruction of mosquitoes inaugurated by Gorgas, malaria steadily decreased until in 1912 there were only four deaths. This means practically the extinction of malaria in Havana, as these four deaths could be attributed to patients brought from infected districts outside of the city.

General Gorgas at all times was the most modest of men, and never for one moment did he fail to minimize his own work in comparison with that of his contemporaries or predecessors. This is shown in the following paragraph in which he summarized the accomplishment in Havana:

"There has been a great deal of discussion as to who deserves the credit for this great discovery. Undoubtedly Reed and his board brought all the threads together and actually made the great discovery; but Finlay, Sternberg, Carter, and others started the spinning of many of these threads. Like all great discoveries everywhere, it was gradually led up to by many workers."[1]

[1] Sanitation in Panama.

III. CHIEF SANITARY OFFICER OF PANAMA

1. Yellow Fever Eradication

Although it was urged that a medical man should be made a member of the Isthmian Canal Commission, as sanitation at Panama, as demonstrated by the experience of the French, was fully as important as engineering, the commission, under the Spooner Act, consisted of seven members, five of whom were engineers, and no physicians.

During the latter part of March, 1904, General Gorgas, with three associates appointed at his request — namely John W. Ross, U. S. N., Major Louis A. LeGarde, surgeon, U. S. A., and Major Cassius E. Gillette, Corps of Engineers, U. S. A.—was ordered to accompany the Panama Commission as its sanitary advisor for the purpose of drawing up a scheme of sanitation whereby the force might be protected during the construction of the Canal. "After much study and careful consideration," he said, "we submitted a report which embodied the organization which we thought necessary to accomplish the desired ends. The report gave detailed estimate of the cost of this organization."[1]

In April, 1904, General Gorgas was ordered to report to the commission as the chief sanitary officer for the Isthmus. He was authorized to employ a certain number of men for the preliminary work, and given an appropriation of $50,000. On May 4, the French company formally transferred the Canal property to the United States, and early in June the work began.

Lack of proper organization was one of the difficulties which had to be met with at the beginning. The supply departments in the United States were slow in furnishing supplies, and few requisitions were filled. This was due to the attempt of the first commission to manage from Washington. Gorgas, however, had taken the precaution to bring with him his $50,000 worth of supplies and his picked personnel, which enabled him to start without undue embarrassment, in direct contrast to the showing of the Engineering Department or the Quartermaster's Department for the same period.

From the careful study made by Gorgas, he realized that the subject of yellow fever was by far the most important phase of sanitation with which he had to deal. The enormous death rate from this disease that the French had suffered would make it very difficult for the United States to supply officials and laborers for the digging of the Canal. The cost for labor would become prohibitive, and the appalling death rate would make Congress hesitate to take the responsibility of continuing the work. The best statistics available showed that the French lost yearly by death from yellow fever about one-third of their entire force. At this rate, with the number of men employed, the United States would lose by death from this dread disease about thirty-five hundred men yearly.

The sanitary problem in Panama was many times greater than that in Havana; the commission in control of the construction of the Canal was located

[1] Sanitation in Panama.

in Washington, and the sole point of contact with this supreme authority was through the then resident governor of the Canal Zone, General George Davis. The commission as a whole at the beginning was prone to underestimate the magnitude of the sanitary problems as well as the cost, and was inclined to look upon the extensive plans of General Gorgas as visionary.

However, Gorgas, with his entire force and financial resources, began his work in an effort to destroy the yellow fever mosquito; to repeat, but with greater intensity, the work that had been so effective in Havana.

One problem that was not present in Havana but that had to be met with in Panama was the care of the enormous influx of unacclimated and non-immune whites who were being brought in as officials and employes of the commission.

"Our force," says Gorgas, "of unacclimated whites liable to yellow fever rapidly increased during the winter of 1904 and the spring of 1905. Yellow fever increased with still greater rapidity. The authorities became more and more alarmed. In January, 1905, the first commission was asked to resign. . . .

"Even after this change, the sanitary department was in no better condition than it had been under the old commission. The chief sanitary officer was still subordinate to the governor of the Canal, and had no means of access to the chairman except through the governor. Such sanitary measures were carried through, the importance of which the chief sanitary officer could impress upon the governor. Those the importance of which the governor could not see, were with great difficulty carried into effect."[1]

This condition of affairs must have been most harrowing to the sanitary authorities who had no doubt of the ultimate success of their plan, based on their experience in Havana, if they were only allowed, unhampered, to carry out their program. The full support of the commission was difficult to obtain.

Conditions with regard to yellow fever, because of the difficulties of carrying out every detail of their plan, "kept going from bad to worse," says Gorgas, "during the first six months of 1905. In April, 1905, several of the higher officials died of yellow fever. This caused widespread panic among the whites, and very great demoralization to the work itself."[1]

In June, 1905, two members of the executive committee of the commission united in a recommendation to the secretary of war that the chief sanitary officer and Dr. Carter, and those who believed with them in the mosquito theory, should be relieved, and men with more practical views appointed in their stead.

Here is where Gorgas demonstrated that he had the courage of his convictions. It would have been an easy matter, and a course sanctioned by general usage in political affairs, for General Gorgas, in these months of obstruction through the ignorance of superior officials, to have compromised and resorted to make-shifts to curry favor with his superior in rank. By these means he might have gained temporary advantage. But Gorgas was too honest to pursue such a course, and it would have been incompatible with his direct way of doing things.

[1] Sanitation in Panama.

"Fortunately, the then President of the United States had been in office when the work at Havana had been done by us," says Gorgas. "He told the commission that the mosquito theory had been established beyond peradventure; that its application had been entirely successful at Havana where yellow fever had been more firmly established and established for a longer time than in Panama. He declined to sanction the change recommended, and directed that every possible support and assistance be extended to the sanitary officials."[1]

About this time Mr. John F. Stevens was appointed chief engineer of the commission and he recommended that the sanitary department should be made an independent bureau and report directly to himself. This enabled the chief sanitary officer, General Gorgas, to make known his needs directly to the highest authority, and there he was accorded loyal support.

"This," remarks Gorgas, "was the high-water mark of sanitary efficiency on the Isthmus, and more sanitation was done at this time than during any other period of the construction of the Canal."[1] With full authority granted to Gorgas and his aids, a repetition of the remarkable accomplishments in Havana came to Panama.

"In looking back over our ten years of work . . . ," says Gorgas, in a burst of justifiable exuberance, "1905 and 1906 seem the halcyon days for the sanitary department. . . . By the fall of 1907, about all of our sanitary work had been completed. Our fight against disease in Panama had been won, and from that time on our attention was given to holding what had been accomplished."[1]

"*One more case of yellow fever occurred in Colon during May; but since May, 1906, now more than eight years, not a case of yellow fever has originated on the Isthmus.*"[1]

2. Malaria Control

After the fall of 1905, when yellow fever had been conquered, attention was given to the elimination of the anopheline mosquito, which is the means of transmission of malaria. The following is the result of the campaign against malaria: In 1906, 821 of every thousand patients admitted to the Canal Zone hospitals had malaria. In 1907, this number in each one thousand was reduced to 426 malaria cases; in 1907, to 282; in 1909, to 215; in 1910, to 187; in 1911, to 184; in 1912, to 110; and in 1913, to the small number of 76.

Inasmuch as a victim of malaria seldom dies of the malady, but he is capable of supplying its germ to any female anopheline mosquito within three years of first infection, the abolition of malaria was practically impossible with seventy-five per cent of the population of the Canal Zone carrying the germs of the disease in their systems.

3. Bubonic Plague

In 1905, a case of bubonic plague appeared in Panama. As this disease is transferred from the rat to the human being by the rat flea, a systematic campaign to rid the Canal Zone of rats was instituted and successfully carried out.

[1] Sanitation in Panama.

4. Results of Sanitation in Panama

In summing up the results of sanitation in Panama, General Gorgas says:

"We have no means of telling what was the sick rate with the French . . . but we know it was very large. [According to General Gorgas' figures, a conservative estimate of the French rate of sickness throughout their operations would be 333 per thousand, or one-third of their force.] Our force during the ten years of construction averaged 39,000 men. If we had had a similar constant sick rate, we should have had 13,000 sick employes in our hospitals every day during the ten years of construction. As it was, we had only 23 per thousand sick each day, a total of 900 for the whole force; that is, we had about 12,000 fewer men sick every day than had the French. . . .

"*We had an average of 900 men sick every day. For the year this would give us 328,500 days of sickness, and for the ten years, 3,285,000 days of sickness. If our rate had been 300 per thousand, a very moderate figure compared with what it was under the French, we should have had 11,700 sick every day, and for the year 4,270,500, and for the ten years, 42,705,000, or an increase of 39,420,000 days of sickness for the whole period.* . . .

"*It cost about one dollar a day to care for a sick man on the Isthmus. The commission cared for the sick free of charge. Every day, therefore, of sickness prevented on the Isthmus lessened the expense which the commission had to bear by one dollar. The commission was therefore saved by this sanitary work, for ten years, $39,420,000.* . . .

"*During the ten years of construction, we lost by death 17 out of every thousand of our employes each year. That is, from the whole force of 39,000 men, 663 died each year, and for the whole construction period we lost 6,630 men. If sanitary conditions had remained as they had been previous to 1904, and we had lost as did the French, two hundred of our employes out of each thousand on the work, we should have lost 7,800 men each year, and 78,000 during the whole construction period.*"[1] *Thus the Gorgas' sanitary program saved the difference between the 78,000 estimate of deaths under the old régime, and the actual 6,630 deaths under the new, or a total of 71,370.*

5. Economic Value of Sanitation in Panama

General Gorgas estimates that the saving to the United States government due to the work of sanitation was a total of $80,000,000, taking into consideration the loss that would have occurred on account of poor morale, and the excessive wages that would have been demanded under less favorable health conditions, in addition to the hospital days saved.

Then, too, one must take into consideration the fact that our great force of men in Panama, because of the sanitary arrangements, was privileged to live in a tropical paradise, where the health conditions were as safe as in any habitable place on earth. "The Canal Zone," says General Gorgas, "for the past four hundred years, ever since it has been known to white man, has been one of the

[1] Sanitation in Panama.

most unhealthy spots in all the tropical world. And now it is one of the garden spots of our civilized world, with a health condition excelled by no land."[1]

IV. GORGAS, THE SOLDIER

1. Reorganization of Medical Corps and Medical Reserve Corps of the U. S. Army in 1916

Gorgas, the sanitarian, had reached the acme of his fame; and at the honorable age of sixty-three, as surgeon general, he was at the head of the peace-time Medical Corps of the United States Army. In 1916, although the President of the United States and a large majority of her people were definitely opposed to entering the European struggle, it was apparent that our country would be drawn into the greatest war of history. Therefore, General Gorgas, while hoping for an early peace, began to urge the reorganization of his corps.

During the spring and summer of 1916 he appeared almost daily before the Military Affairs committees of the Senate and House, and personally advised the legislators in their preparation of the army bill. It was during this time that the courtesies of the floor of the Senate Chamber were extended to him as the authorized head of the Medical Corps of the United States Army.

In the spring of the same year he was anxious to expand the Medical Reserve Corps, and as he desired to secure the best men obtainable, he consulted those who were in authority in the leading medical organizations of the country and asked them to aid him in making his selections. There could have been no safer way, and the results immediately justified his judgment. Throughout the war it was his policy to utilize every available means to add to the number and efficiency of his corps. He repeatedly said: "I want all the help I can get."

General Gorgas was quick to recognize the importance of the specialist in the organization of his corps, as it enabled each man to fill the particular place for which he had been trained and in which he could render the highest service.

2. Increased Rank for Medical Officers

It became apparent early in 1917, shortly after our country entered the war, that a provision should be instituted that would make it possible for our Medical Reserve Officers to receive rank higher than that of major. General Gorgas was always very much interested in all subjects that had to do with medical matters, and he was keenly alive to the necessity for this increased rank; and he never failed to use his influence and initiative to make his desires known. He realized that this was a war that would require the services of the very best of the medical profession, and to its organization would be attracted our most eminent and influential practitioners of medicine, surgery, and dentistry. The armies of Europe, including our allies, England, France, and Italy, during three years of actual warfare, had seen the necessity in the organization of their respective medical reserve corps of giving advanced rank to their medical

[1] Sanitation in Panama.

officers, many of whom were then serving as lieutenant colonels, colonels, brigadier generals, and even major generals. In our overseas armies, our medical officers would soon be associated with these medical officers of European nations. Immediately they would find themselves at a distinct disadvantage in their association with them, and they would be subjected to humiliation because of their lower rank, although they would be performing the same duties and assuming the same responsibilities.

The executive committee of the Council of National Defense presented the subject to Secretary of War Baker, and through him the committee was invited to present its case to the War College. General Gorgas, Dr. Charles H. Mayo, Dr. William H. Welch, Dr. Victor C. Vaughan, and the writer made up the committee on the occasion of its first appearance before the War College. A strong argument was presented by General Gorgas in favor of increased rank for medical officers, and a general discussion followed in which all members of the committee who were present participated, as well as the group of officers representing the War College. While our requests were not definitely turned down in these early discussions, it soon became apparent to us that no move was being made to change the law or regulations, and finally we were convinced that the initiative along this line would have to come from us.

Senator Owen was selected to look after our interests in the Senate, and we co-operated with him in formulating a bill. Because of the lack of enthusiasm in our behalf on the part of the secretary of war and the general staff, the whole subject was presented to President Wilson, with a plea for his support. To the great satisfaction of the executive committee of the General Medical Board, the following reply was received from the President:

March 5, 1918

My dear Doctor Martin:

I read very carefully your memorandum of February twenty-seventh about the rank accorded members of the Medical Corps of the Army and have taken pleasure in writing letters to the chairmen of the Military Committees of the House and Senate, expressing the hope that the bill and resolution may be passed.

Cordially and sincerely yours,
(Signed) Woodrow Wilson.

Dr. Franklin Martin
Advisory Commission
Council of National Defense
Washington, D. C.

With the introduction of Senator Owen's bill, a prolonged series of hearings on the subject were held before the Senate Committee on Military Affairs. Later a bill was introduced in the House by Representative Dyer, which modified in some unessential details the Senate bill. This brought the matter before the Committee on Military Affairs of the House. After many hearings in these committees, almost all of which were attended by General Gorgas and the writer, and at various times other members of the executive committee, including Dr. William J. Mayo, Dr. Victor C. Vaughan, Dr. Charles H. Mayo, Dr. William H. Welch, Dr. Frank F. Simpson, and others, it was deemed wise to combine the

Senate and House bills into one uniform bill. This resulted in a meeting in my office as the medical representative of the Advisory Commission of the Council of National Defense, where the Owen-Dyer bill was formulated. General Gorgas, Senator Owen, Representative Dyer, and Brigadier General (then Colonel) Noble and the writer were present at this meeting. General Gorgas practically dictated the changes that were agreed upon, and the bill was written. The following day the Owen-Dyer bill was presented simultaneously in both houses of Congress, in the Senate by Senator Owen, and in the House by Representative Dyer. After many vicissitudes and alterations, it was attached as a rider to the general appropriations bill.

Before the Owen-Dyer bill was dignified by becoming a rider to the general appropriations bill, a serious propaganda for and against the bill was waged for a considerable period of time. Many hearings were held before the Military Affairs committees, and General Gorgas was at the forefront in his advocacy of our bill. Members of the different medical societies were requested to exert their influence with their Senators and Representatives, urging them, by resolutions and by personal letters, to pass the Owen-Dyer bill. During this time of intense opposition, General Gorgas and I were called before Assistant Secretary of War Crowell and Chief of Staff March for pernicious activity in behalf of the Owen-Dyer bill. The assistant secretary proceeded to quiz Surgeon General Gorgas regarding his activities in advocating legislation concerned with the corps, the uniform of which he wore and of which he was the head. It was even intimated that he had in public addresses urged men to write to their Congressmen and Senators, instructing them to vote in a certain way. When General Gorgas was asked directly if he had committed these indiscretions, he answered that he could not remember that he had been guilty of the particular act of which he was accused. "But," he said, in his direct and outspoken manner, "you know, Mr. Secretary, I am in favor of the passage of the Owen-Dyer bill, and I would consider myself disloyal to my corps if I did not do everything in my power to bring about its passage."

The assistant secretary was disarmed by this frank statement, and evidently forgetting to make the point that it was contrary to regulations for an officer to interest himself in legislation, he began to argue the merits of the bill for increased rank. He asked General Gorgas if he was not inconsistent in urging higher rank for members of his reserve corps when there were other reserve corps for which such increased rank would be equally desirable. "Not at all," the General replied. "I have no definite knowledge of the requirements of the other corps, and I should never think of interfering in their organization. I do, however, know the needs of my own corps, and I feel that I must favor such a change in the law as will meet them."

General Gorgas was then asked to explain just how the passage of this law would benefit his corps. In his quiet, convincing manner he responded by drawing a mental picture of his vast corps, with its service in the camps of this

country; its service overseas where the distinguished members of our medical profession, serving as majors, were working side by side with their distinguished confrères of Europe who, while performing the same duties, were colonels, brigadier generals, and major generals, thus outranking our own men and bringing many unnecessary humiliations to bear upon them. The story was so convincing, so unanswerable, and so pleadingly told (the names of well-known civilian doctors serving as illustrations), that the General, obviously, had won his case.

Finally, the general appropriations bill, of which the Owen-Dyer bill had become a rider, was passed by the House and the Senate, and was in the hands of the conference committee, appointed by the two Houses of Congress, for agreement. The conference committee was to report that day, and at a given hour in the afternoon the completed bill was to be ratified by both Houses.

At this time (Secretary of War Baker having returned from overseas) a desperate, vicious attack was inaugurated against the bill by the subtle propagandists. A conference between the secretary of war and Senator Owen much disturbed the Senator, who was one of the authors of the bill. It appeared that there was much opposition, especially to the creating of the higher ranks of brigadier general and major general. The argument was urged that if the opposition of the secretary of war, and of the War College, represented by the chief of staff, should induce the President to veto the bill because of this rider, the whole general appropriations bill would fail of passage. An appeal to the patriotism of those supporting the Owen-Dyer bill, asking them to abandon the essential features thereof, was adopted as a ruse of the opposition in an effort to gain its point.

At nine o'clock in the morning, after an interview with Senator Owen and a conference with the official advisors of his own department, General Gorgas came to the writer's office, much depressed. The conference committee was to report early in the afternoon and the two branches of Congress were to take a final vote on the ratification of the bill. They had urged that he should consent to abandon the superior rank and be satisfied to retain the lieutenant colonels and colonels, or otherwise he would lose all. Before deciding the matter, he wanted to obtain my reaction and advice, inasmuch as we had always been in absolute accord on the subject and had consulted each other on all changes of policy. He recited the whole story and, instead of asking my advice as to what his attitude toward a compromise should be, he asked me what I would do under the circumstances. I was deeply concerned at the turn of affairs, and appreciative of the sense of responsibility under which the General was laboring. He had been urged to compromise further. What should he do? He had fought so hard and so long for his precious bill, and by holding out he might lose all, whereas by yielding he might spare something. But he had asked me a question: What would I do? Finally I said: "General, I would not yield another inch." He rose from his chair, rushed over to me, grasped my hand, and said: "I hoped you would say that. In my own mind I had already decided on that course."

We laughed at each other and went over the whole situation. The opposition had told the General that the President might veto the bill because of the supposed attitude of opposition to the Owen-Dyer rider in the War Department. Had we not received a letter from the President months before in which he stated that he favored our bill? Would the President veto it without consulting with us and telling us why? Why not tell him of the rumors, remind him of his promise, and ask him, if he was still of the same opinion, to make his views known to the proper authorities? I communicated with the White House and explained the situation. At noon, while we were holding an executive committee meeting in my office in the Council of National Defense (with General Gorgas, the surgeon general of the Navy, the surgeon general of the Public Health Service, Dr. Victor C. Vaughan, and Dr. William H. Welch present), Admiral Grayson telephoned to me and said that the President had communicated to the proper authorities his wishes as previously written to me. I assumed that our bill would pass unchanged that afternoon, and that the President would sign it.

General Gorgas was not very demonstrative, but in those trying days of the war I do not believe I ever saw him so happy as he was later that day. The Owen-Dyer bill was passed by Congress that afternoon as a rider to the general appropriations bill, and was signed by the President.

V. CONCLUSION

In Gorgas one finds the same outstanding qualities which are the embodiment of the mind and character of every genius. He visualized a conspicuous object that required accomplishment. With an open and untrammeled mind, which could disregard tradition, he utilized the essential materials at hand and conceived a simple formula which enabled him to accomplish his task. With his clear vision and this formula, the direct mind of the genius ignoring all irrelevancies, he proceeded to execute his plans. Then followed the stupendous task of achievement, which required the exercise of patience, tolerance, untiring perseverence that could circumvent unwise opposition, and, finally, unconquerable industry.

Gorgas possessed not only the attributes of a genius, but as well the admirable traits of character that made him a normal man in the midst of conventional surroundings. Gorgas was princely, with the simplicity of a child. He loved his fellowmen to the extent that he saw good in all; and by his tolerant sympathy, he drew men to him who, by the thousands, claimed him as friend. His great work he shared with able contemporaries who were selected by him as aids, and with almost unerring judgment. His pride of proprietorship in his work, if he possessed it at all, was obscured by his desire to accomplish a useful thing, and he utilized every legitimate factor that would bring success to his enterprise. He commanded his great armies of aids, in his civil work as well as in his war work, not by autocratic methods, but by power of persuasion, and by the example of his own industry. In his official life, in his social life, and in his family life, he was the true friend of mankind, the courteous gentleman, and always the cavalier.

FRANKLIN H. MARTIN

BOOK REVIEWS

A CRITIQUE OF NEW BOOKS ON SURGERY

THE active surgeon of the present day, overpressed with the details of his practice and having so little time for even the most necessary study of the ever-widening field of scientific surgery, may be justly accused of neglecting the broadening influence that comes from reading the history and works of our great master surgeons of the past. This deprives him not alone of its cultural advantages but also prevents him from developing the proper perspective of the various problems that present themselves in study and technique.

For this reason American surgery should hold itself fortunate in being presented with a translation of parts of the "Great Surgery" of Guy de Chauliac,[1] and the translator should have the thanks of our entire profession. Written in 1365, this great surgery was the authority for 400 years — a period long enough to look down with cynical amusement upon our vaunted but ephemeral textbooks of today. What system have we now that can boast of sixty printed editions. Sixteen are known in the Latin, forty-three in French, five in Italian, four in Dutch, some in German, some Spanish, and one in English published in 1541 now long forgotten. There are known fourteen complete editions of the Fifteenth Century, thirty-eight of the Sixteenth, seventeen of the Seventeenth Century, besides a large number of abridgments. And yet but for the scholarly devotion of Brennan this great work would have been lost to the average surgeon of our day. He has translated the parts most interesting to us, dealing with wounds, fractures, and dislocations. That Guy de Chauliac was rightly called the Father of Surgery as Hippocrates was called the Father of Medicine, no surgeon will deny after reading the sane and wise directions for the care of patients — and it makes us a little humble to find that many of the principles of surgery that we follow today and thought were discovered in our day, were known and taught by this master surgeon.

The translator has aimed at a literalness in translation and this has at times marred the smoothness of its diction, but this is a captious criticism in view of the great service rendered to American surgery. For its cultural influence, if for nothing else, the book should be in the hands of every surgeon who aspires to be more than a mere technician.

There may be some difference of opinion as to what constitutes a great surgeon — personally I should say, first, honesty; second, industry; third, imagination; and fourth, technical efficiency, but no one could gainsay that Guy de Chauliac in his preface, when he describes what a surgeon ought to be, reached a plane that every modern surgeon should be proud to occupy.

"It is required that the surgeon should know not only the principles of surgery, but also those of medicine in theory and practice; that he should have seen others operate; that he should be ingenious, of good judgment and memory to recognize conditions; and that he be adaptable and able to accommodate himself to circumstances. Let the surgeon be bold in all sure things, and fearful in dangerous things; let him avoid all faulty treatments and practices. He ought to be gracious to the sick, considerate to his associates, cautious in his prognostications. Let him be modest, dignified, gentle, pitiful, and merciful; not covetous nor an extortionist of money; but rather let his reward be according to his work, to the means of the patient, to the quality of the issue, and to his own dignity." A. B. K.

THIS little monograph on deep roentgen therapy[2] is a well written, clear exposition of the subject, explaining the various theories and methods so that they are easily understood. The statements are brief, but lucid and unprejudiced.

The author does not believe it possible to accept without reservation the statement of Seitz and Wintz, that 110 per cent of the erythema dose is the lethal dose for cancer cells, but it may afford a basis for estimating dosage.

Régaud and Nogier's theory of the specific biological action of rays of different wave lengths is discussed and contrasted with the views of Friedrich and Koenig, who believe the biological action is independent of the wave lengths, depends upon the dose absorbed by the tissues, and is the same for filtered or unfiltered rays.

He discusses in detail the physics of roentgen therapy and explains divergence of the rays in the tissues. Useful suggestions are given to calculate the depth of penetration, using water as a standard of comparison, and useful tables of absorption values are given. Cross fire is explained and evaluated.

He devotes considerable attention to a description of apparatus aad describes the most popular types at length. He also discusses the latest French advances and explains their advantages.

Measurement of dosage is carefully and efficiently

[1] GUY DE CHAULIAC (A.D. 1363): ON WOUNDS AND FRACTURES. Translated and published by W. A. Brennan, A.B., Chicago, 1923.

[2] LA RADIOTHÉRAPIE PROFONDE. By Iser Solomon. Paris: Masson et Cie, 1923.

dealt with and the ionization method thoroughly explained. The author's ionometer is described and illustrated.

The work throughout is excellent, concise, clear, and authoritative, is an ideal book for beginners, and will be found of value also to those of experience.

DAVID C. STRAUS.

THIS is the second volume[1] of this work. The first volume, which was published in 1918, dealt with the general consideration of fractures, including treatment. This new volume deals with special fractures, considering each bone separately. The material is divided into seven sections dealing respectively with fractures of the skull, including fractures of the bones of the face; fractures of the vertebræ; fractures of the pelvis; fractures of the ribs and sternum; fractures of the shoulder girdle; fractures of the upper extremities; and fractures of the lower extremities.

The book is very well illustrated with photographs, diagrammatic sketches, and a large number of X-rays of cases demonstrating the points discussed. The numerous diagrammatic sketches, illustrating the mechanism of fracture and the lines of force produced by the action of the various muscles on the fragments, explaining the resultant deformity, are extremely valuable. In the black and white diagrammatic sketches the use of red ink to show the lines of fracture and the lines of muscular force is striking.

Some clever new German methods and apparatus are shown, and, in general, the subject is handled masterfully. Some minor criticisms may be made, as for example in the treatment of fractures of the patella too much stress is laid on the wiring of the fragments. In some cases the details and duration of after-care are not complete. The American and British apparatus and methods are not adequately discussed.

The bibliography refers only to the older fundamental publications and to the recent literature since 1901. As is usual in German publications, the references to British, French, and American literature are disproportionately meager.

The work, as a whole, is one of the best treatises on fractures that has appeared in any language. It gives an excellent idea of the present German methods of treatment, without, however, paying sufficient attention to the methods used in other countries. Nevertheless, it is a book which should be in the hands of all those who are doing special work in fractures.

DAVID C. STRAUS.

[1] DIE KNOCHENBRUECHE UND IHRE BEHANDLUNG; Ein Lehrbuch fuer Studierende und Aerzte. By Dr. Med. Hermann Matti. vol. ii. Die spezielle Lehre von den Knochenbruechen und ihrer Behandlung einschlie.slich der komplizierenden Verletzungen des Gehirns und Rueckenmarks. Berlin: Julius Springer, 1922.

AS stated by the authors, the appearance of the second edition of this voluminous work[2] so closely follows its initial publication as to preclude any radical changes in the text or illustrations.

There is no question as to the efficacy of teaching neurology from the standpoint of correlation of anatomic, physiologic, and clinical facts. Unfortunately it has been true that the student has been taught the anatomy and physiology of the nervous system with utter disregard for the fact that these subjects might have been made more interesting by pointing out their clinical significance. On the other hand the diseases of the nervous system are taught by asking the student to recite parrot-like the symptoms and signs of given clinical entities. Successful teaching of neurology must correlate these subjects for the student.

It would seem, however, that the volume under consideration is quite too ponderous for the average undergraduate medical student. There can be no question as to its value and merit as a book of reference for anyone interested in clinical neurology.

LOYAL E. DAVIS.

[2] THE FORM AND FUNCTIONS OF THE CENTRAL NERVOUS SYSTEM. By Frederick Tilney, M.D., Ph.D., and Henry A. Riley, A.M., M.D. 2nd ed. New York: Paul B. Hoeber, 1923.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

DISEASES OF THE RECTUM, ANUS AND COLON. 3 vols. By Samuel G. Gant, M.D., LL.D. Philadelphia: W. B. Saunders Company, 1923.

HYDRO- UND THERMOTHERAPIE VON INNEREN UND NERVEN-KRANKHEITEN. By Dr. Ernst Tobias. Berlin: Urban & Schwarzenberg, 1923.

LEGAL MEDICINE AND TOXICOLOGY. Edited by Frederick Peterson, M.D., LL.D., Walter S. Haines, A.M., M.D., and Ralph W. Webster, M.D., Ph.D. 2nd ed., vols. i & ii. Philadelphia: W. B. Saunders Company, 1923.

COLLECTED PAPERS FROM THE WASHINGTON UNIVERSITY SCHOOL OF MEDICINE. vol. i, 1921. St. Louis: C. V. Mosby Company, 1923.

CLINICS AND COLLECTED PAPERS OF ST. ELIZABETH'S HOSPITAL, RICHMOND, VIRGINIA. vol. of 1922. St. Louis: C. V. Mosby Company, 1923.

TRAITÉ PRATIQUE DE CYSTOSCOPIE ET DE CATHÉTÉRISME URÉTÉRAL. 2d ed. By G. Marion and M. Heitz-Boyer. Paris: Masson et Cie, 1923.

EXPLORATION CLINIQUE ET DIAGNOSTIC CHIRURGICAL. By Felix Lejars. Paris: Masson et Cie, 1923.

LEHRBUCH DER PHYSIKALISCHEN, BIOLOGISCHEN UND KLINISCHEN GRUNDLAGEN ZUR STRAHLEN-TIEFEN-THERAPIE UND IHRER ANWENDUNG IN DER GYNAEKOLOGIE. By Prof. Dr. Ernst von Seuffert. Berlin: S. Karger, 1923.

APPLIED PSYCHOLOGY FOR NURSES. By Donald A. Laird. Philadelphia and London: J. B. Lippincott Company, 1923.

THE TONSILS, FAUCIAL, LINGUAL, AND PHARYNGEAL, WITH SOME ACCOUNT OF THE POSTERIOR AND LATERAL PHARYNGEAL NODULES. By Harry A. Barnes, M.D. St. Louis: C. V. Mosby Company, 1923.

CEREBROSPINAL FLUID IN HEALTH AND IN DISEASE. By Abraham Levinson, B.S., M.D. With a foreword by Ludvig Hektoen, M.D. St. Louis: C. V. Mosby Company, 1923.

EPIDEMIOLOGY AND PUBLIC HEALTH. VOL. II.—NUTRITIONAL DISORDERS, ALIMENTARY INFECTIONS AND PERCUTANEOUS INFECTIONS. By Victor C. Vaughan, M.D., LL.D., assisted by Henry F. Vaughan, M.S., Dr. P.H., and George T. Palmer, M.S., Dr. P.H. 3 vols. St. Louis: C. V. Mosby Company, 1923.

TONSILLECTOMY BY MEANS OF THE ALVEOLAR EMINENCE OF THE MANDIBLE AND GUILLOTINE; WITH A REVIEW OF THE COLLATERAL ISSUES. By Greenfield Sluder, M.D. St. Louis: C. V. Mosby Company, 1923.

ANÆSTHETICS IN PRACTICE AND THEORY. By J. Blomfield, O.B.E., M.D. (Cantab.). Chicago: Chicago Medical Book Company, 1923.

OPTOTYPES CONSISTING OF TEST-LETTERS AND PICTOGRAPHS FOR MEASURING THE ACUTENESS OF VISION. By John Green, M.D., LL.D., and A. E. Ewing, A.M., M.D. St. Louis: C. V. Mosby Company, 1923.

CHIRURGIE DES VOIES BILIAIRES. By Henri Hartmann, in collaboration with MM. Boppe, Hautefort, Petit-Dutaillis, Renaud, Uhlrich and Virenque. Paris: Masson et Cie, 1923.

FIRST AID X-RAY ATLAS OF FRACTURES AND DISLOCATIONS. By H. C. Orbin, O.B.E., F.R.C.S. (Edin.). New York: Paul B. Hoeber, 1923.

FIRST AID X-RAY ATLAS OF THE ARTERIES. By H. C. Orbin, O.B.E., F.R.C.S.(Edin.). New York: Paul B. Hoeber, 1923.

INTERNATIONAL CLINICS. Edited by Henry W. Cattell, A.M., M.D. Philadelphia: J. B. Lippincott Company, 1923.

THE OPERATIVE TREATMENT OF GLAUCOMA. By H. Herbert, F.R.C.S. (Eng.). New York: Messrs. Wood & Company, 1923.

MERCK'S MANUAL OF THE MATERIA MEDICA, A READY REFERENCE POCKET BOOK FOR THE PHYSICIAN AND SURGEON, compiled and published by Merck & Co., New York, 1923.

THE URETHRA AND THE URETHROSCOPE. By F. Carminow Doble, M.R.C.S., L.R.C.P., with foreword by Major A. T. Frost, O.B.E., R.A.M.C. New York: Oxford University Press, 1923.

PRACTICAL LOCAL ANESTHESIA AND ITS SURGICAL TECHNIC. By Robert Emmett Farr, M.D., F.A.C.S. Philadelphia and New York: Lea and Febiger, 1923.

URGENT SURGERY. By Felix Lejars. 3d Eng. Translation from 8th French ed. By W. S. Dickie, F.R.C.S., and Ernest Ward, M.A., M.D., F.R.C.S. New York: William Wood & Co., 1923.

INTERNATIONAL MEDICAL ANNUAL; A YEAR BOOK OF TREATMENT AND PRACTITIONER'S INDEX. New York: William Wood & Co., 1923.

SURGICAL "DON'TS" (AND "DO's"). By C. Hamilton Whiteford, M.R.C.S., L.R.C.P. London: Harrison & Sons, Ltd., 1923.

COLLECTED PAPERS OF THE MAYO CLINIC. vol. xiv, 1922. Edited by Mrs. M. H. Mellish. Philadelphia: W. B. Saunders Company, 1923.

A REPORT ON THE SCIENTIFIC WORK OF THE SURGICAL STAFF OF THE WOMAN'S HOSPITAL IN THE STATE OF NEW YORK, vol. iv, 1921–1922. Edited by George Gray Ward, M.D., F.A.C.S. St. Louis: C. V. Mosby Company, 1923.

CHRONOLOGIA MEDICA, A HANDLIST OF PERSONS, PERIODS AND EVENTS IN THE HISTORY OF MEDICINE. By Sir D'Arcy Power, K.B.E., M.B.(Oxon.), F.R.C.S.(Eng.), and C. J. S. Thompson, M.B.E. New York: Paul B. Hoeber, 1923.

PAPERS FROM THE MAYO FOUNDATION FOR MEDICAL EDUCATION AND RESEARCH AND THE MEDICAL SCHOOL OF THE UNIVERSITY OF MINNESOTA. vol. ii, 1921–1922. Philadelphia: W. B. Saunders Company, 1923.

EXCURSIONS INTO SURGICAL SUBJECTS. By John B. Deaver, M.D., Sc.D., LL.D., and Stanley P. Reimann, M.D. Philadelphia: W. B. Saunders Company, 1923.

TRAITÉ D'OBSTÉTRIQUE. 9th ed.—2 vols. By A. Ribemont-Dressaignes and G. Lepage. Paris: Masson et Cie, 1923.

THE NOTE BOOK OF AN ELECTRO-THERAPIST. By Dr. Mel R. Waggoner. McIntosh Electrical Corporation, Chicago: 1923.

DIE NIERENFUNKTIONS-PRUEFUNGEN IM DIENST DER CHIRURGIE. By Dr. Ernst Roedelius. Berlin: Julius Springer, 1923.

BIRTH STATISTICS FOR THE BIRTH REGISTRATION AREA OF THE UNITED STATES. Seventh Annual Report. Washington: Government Printing Office, 1923.

A CLINICAL GUIDE TO BEDSIDE EXAMINATIONS. By H. Elias, N. Jagic and A. Luger. Translated and arranged by Dr. Wm. A. Brams. New York: Rebman Company, 1923.

ENDOCRINE DISEASES. By Wilhelm Falta. Translated and edited by Milton K. Meyers, M.D. Philadelphia: P. Blakiston's Son & Co., 1923.

JOHN B. MURPHY MEMORIAL
Marshall & Fox, Architects

AMERICAN COLLEGE OF SURGEONS

THE JOHN B. MURPHY MEMORIAL BUILDING OF THE AMERICAN COLLEGE OF SURGEONS

THE construction of the John B. Murphy Memorial Building of the American College of Surgeons is begun, and the corner stone will be laid with appropriate ceremony on Tuesday, October 23rd, at 3:30 p.m. The date has been fixed during the week of the annual Clinical Congress of the American College of Surgeons so that many of the Fellows may be present to participate in this important event which is of such great interest to the College.

The architecture of the building is suggested by the reproduction of the drawing on the opposite page. Competent critics pronounce the design of very unusual merit, reflecting great credit upon the architects, Messrs. Marshall & Fox. The character of the monumental building is clearly indicated by the design, which, when translated into enduring concrete, stone, bronze, and marble, with striking individuality and beauty of detail, will be appropriate not only to the purpose, but will be recognized generally as one of the most evident architectural features of Chicago-beautiful.

The principal feature of the interior will be the Memorial Hall, in every way worthy of, and in harmony with, the exterior. This hall will be in frequent use by the American College of Surgeons and the various medical societies of Chicago and vicinity. Below the main auditorium is planned a small hall of about two hundred seating capacity which will be constantly utilized by committees and the smaller medical organizations for their meetings. The remainder of the building is designed for the requirements of the College, particular attention being given to providing proper facilities for the Library, and for the Literary Research Department which is of rapidly increasing interest and importance on account of the many requests for service from the Fellows.

The completion of this great Memorial Building project marks an epoch in the relations of the medical profession to the general public as evidenced by this monumental structure, built in recognition of scientific services rendered to humanity. To the American College of Surgeons a valuable asset is to be presented, a creation of beauty to become the center of the organized activities of the members of the surgical profession resident on the Western Hemisphere.

The location is in the choice portion of the wonderful development along Michigan Boulevard, north of the river, one block west of the Boulevard, and only a few minutes' walk from the loop. This was very recently the most desirable residential district, and here were clustered the homes of the oldest and most affluent families.

The entire frontage of the block in which the Memorial Building will stand is now practically owned by the College. In the center will rise the beautiful new structure; on the west corner is the remarkable old building for years one of Chicago's show places, now the home of the executive offices of the College; on the east will stand a great modern office building, the home of the official organ of the College, SURGERY, GYNECOLOGY AND OBSTETRICS. When completed these three structures will provide the American College of Surgeons with buildings and facilities which, in beauty and monetary value, will be unequaled by those of any other similar organization in the world.

The ceremony of cornerstone laying will be consistent with the importance of the occasion. William E. Dever, mayor of Chicago, will preside and many other distinguished guests will be present. The Regents of the College and all the Fellows will be invited to participate, wearing the official cap and gown. The many other friends of the College who have contributed to make possible the realization of this project are also particularly urged to be present on this ceremonial occasion.

AN END-RESULT STUDY OF THE CASES OPERATED UPON BEFORE THE TWELFTH ANNUAL MEETING OF THE CLINICAL CONGRESS OF AMERICAN COLLEGE OF SURGEONS AT BOSTON, OCTOBER 24–27, 1922

By ELLIOTT C. CUTLER,[1] M.D., F.A.C.S., Boston

IN his presidential address[2] before the College of Surgeons in October of last year, Dr. Cushing made the following statement:

"The College cannot wish to foster the mere spectacularization of surgery so prevalent in days gone by, and the Boston members have decided to follow again the same course they pursued when the Congress met here before—the only course they can see whereby this tendency can in a measure be offset—namely, by a subsequent report, to be published in the official organ of this body, not only of the immediate but of the late results of all the public operations performed in the Boston hospitals before members of the College at this meeting."

The committee on arrangements for the Boston meeting, in accordance with this statement and with a pre-arranged agreement on the part of all those who participated in the operative clinics before the Congress, are prepared to make the promised report. Each member of the committee who represented a local hospital was made responsible for answering the questionnaires and letters. One member of the committee (the author of the present report) was appointed to assemble the material from the various hospitals after a sufficient number of months had elapsed to justify this final report on as many cases as could be located.

Operations were performed in twenty hospitals in Boston from October 24 to 27, 1922. The daily bulletins printed at the Congress headquarters listed 304 surgical operations in sixteen hospitals. The proportionate distribution of these operations as listed is charted, Table I. Four participating hospitals are not recorded because of insufficient data in the bulletins, viz.:—The Forsyth Dental Infirmary, The Huntington Memorial Hospital, the Massachusetts Charitable Eye and Ear Infirmary, and the Boston Lying-In Hospital.

A preliminary questionnaire was sent out the day after the Congress was over. Reports were

TABLE I.—DISTRIBUTION OF OPERATIONS AT VARIOUS HOSPITALS

Hospitals	Oct. 24	Oct. 25	Oct. 26	Oct. 27	Totals
Boston City	8	6	9	9	32
Massachusetts General	14	13	13	10	50
Peter Bent Brigham	7	9	7	7	30
Children's	9	8	9	7	33
Massachusetts Homeopathic	12	7	8	0	27
St. Elizabeth's	7	4	9	6	26
Carney	3	6	5	0	14
Free Hospital for Women	9	9	8	8	34
New England Deaconess	0	5	6	0	11
Boston Dispensary	1	0	0	0	1
New England Hospital for Women and Children	2	2	0	0	4
Evangeline Booth	0	0	2	0	2
Cambridge	0	5	0	3	8
Long Island	0	7	0	4	11
U.S. Naval	2	4	0	0	6
Beth Israel	1	2	4	8	15
	75	87	80	62	304

TABLE II.—COMPARISON OF REPLIES TO QUESTIONNAIRES 1 AND 2

Hospitals	Cases operated upon as reported in preliminary questionnaire, Oct., 1922.	Cases operated upon as reported in final questionnaire, July, 1923.	Maximum number of cases reported in questionnaires 1 and 2.
Boston City	9*	24	24
Massachusetts General	46	46	46
Peter Bent Brigham	30	30	30
Children's	0	27	27
Massachusetts Homeopathic	41	41	41
St. Elizabeth's	21	0	21
Carney	20	23	23
Free Hospital for Women	29	29	29
New England Deaconess	11	11	11
Boston Dispensary	1	0	1
New England Hospital for Women and Children	7	7	7
Evangeline Booth	1	1	1
Long Island	8	8	8
Cambridge	13	13	13
U.S. Naval	6	6	6
Beth Israel	10	10	10
	253	276	298
Lying-In†	1	1	1
The Forsyth Dental Infirmary†	13	0	13
Massachusetts Charitable Eye and Ear Infirmary†	0	15	15
	267	292	327

*Preliminary report covers only one service—final report covers all cases.

†Not included in Table I, therefore cases not added in total for comparison.

[2]Surgical end-results in general. Surg., Gynec. & Obst., 1923, xxxvi, 304.

[1] Member of the Committee on Arrangements delegated to collect and publish the results obtained in patients operated upon before the Congress.

TABLE III.—DEATHS AND COMPLICATIONS

Hospital	Cases reported	Deaths					Complications			
		Number of deaths	Diagnosis	Operation	Lived post-operative	Cause of death	Number of cases	Diagnosis	Operation	Complications
Boston City	24	1	Gastric ulcer	Gastro-enterostomy	4 days	Hæmorrhage	0			
Massachusetts General	46	2	Fæcal fistula	Closure stoma	24 hours	Senile debility	3	Contraction of the neck	Pedicle graft	Infection and bronchitis
								Cancer sigmoid	Excision of colostomy	Hæmorrhage, urinary drainage through wound and extensive urinary infection
			Cancer of stomach	Pylorectomy	4 days	General peritonitis		Pyelonephrosis	Nephrectomy	Protracted fever
Peter Bent Brigham	30	3	Subtentorial tumor, glioma	Cerebellar exploration	24 hours	Shock	1	Hyperthyroidism	Partial thyroidectomy	Hæmorrhage six hours after operation — operation for control
			?Cholecystitis, ?Malignant disease of intestine	Cholecystectomy and choledochostomy	30 days	Pulmonary embolus				
			Carcinoma of bladder	Partial resection of bladder	4 days	Pneumonia				
Children's	27	1	Embryoma of left kidney	Nephrectomy	1½ hours	Shock	1	Hare-lip and cleft palate (left)	Edges of cleft palate refreshed	Nasopharyngitis, wound infection
Massachusetts Homeopathic	41	3	Hypertrophy of prostate	Suprapubic cystotomy	6 days	General debility	2	Carcinoma of uterus and fibrosis of ovary	Salpingectomy right, oophorosalpingectomy left, hysterectomy	Secondary anæmia persists
			Fibromyoma of uterus	Oophorosalpingectomy, left; salpingectomy, right	6 days	Cardiac		Hernia right, inguinal indirect	Herniotomy right, inguinal	Follicular tonsillitis
			Fibromyoma of uterus and fibrocystoma of of ovary	Hysterectomy supracervical, appendectomy, right salpingectomy, and left oophorosalpingectomy	24 hours	Hæmorrhage				
St. Elizabeth's	21	0					0			
Carney	23	2	Carcinoma of uterus	Hysterectomy for ?malignancy	36 hours	Myocarditis and shock	0			
			Carcinoma of stomach	Pylorectomy for carcinoma at pylorus	22 hours	Surgical shock				
Free Hospital for Women	29	0					0			
New England Deaconess	11	0					0			
Boston Dispensary	1	0					0			
New England Hospital for Women and Children	7	2	Carcinoma of bladder	Suprapubic cystotomy	13 days	Acute cardiac dilatation	0			
			Chorio-epithelioma of uterus	Complete supravaginal hysterectomy	16 days	Metastases to lungs and brain				
Evangeline Booth	1	0					1	Pregnancy	Cæsarean section	Phlebitis
Cambridge	13	0					1	?Ovarian tumor	Exploratory laparotomy, appendectomy	Superficial wound infection

TABLE III.—DEATHS AND COMPLICATIONS—*Continued*

Hospital	Cases reported	Deaths					Complications			
		Number of deaths	Diagnosis	Operation	Lived post-operative	Cause of death	Number of cases	Diagnosis	Operation	Complications
Long Island	8	0					0			
U. S. Naval	6	0					2	Gastric ulcer	Gastro-enterostomy	Still has symptoms of active ulcer
								Foreign bodies in right knee	Arthrotomy through the patella	Sepsis of knee ending in bony ankylosis
Beth Israel	10	0					0			
Boston Lying-In	1	0					0			
Massachusetts Charitable Eye and Ear Infirmary	15	0					1	Mastoiditis	Right simple mastoid	Pneumonia and empyema
Forsyth Dental Infirmary	13	0					0			
Totals	327	14					12			
Percentage		(4.3%)					(33.7%)			

received from eighteen of the twenty hospitals that participated. A final questionnaire was sent out in July, 1923, and this time eighteen of the twenty hospitals submitted data in regard to the cases operated upon by their staffs. The number of cases reported on the two occasions is charted on page 564 (Table II), and show an expected discrepancy with the bulletin figures on Table I.

A comparison of Tables I and II shows a very creditable number of cases listed in the reports from the hospitals, and there is enough similarity in the figures given in the bulletin with what was actually performed in the hospitals to make one realize the amount of care put into the publications of the daily bulletins. A shrinkage of only 6 cases is actually very small. Could we obtain careful end-result figures on such a large number of cases much might be learned. However, as has already been suggested, the division of responsibility made this impossible. In spite of professed interest at the time the decision was made to render such a report, there was little enthusiasm in the search for the end-results by the time the final questionnaire was sent out. This was not unforeseen, for those familiar with this pursuit realize the immense amount of labor involved. To be accurate, such reports entail the personal physical examination of each patient and this, in turn, must be preceded by the far more laborious and time-consuming task of finding the patients and getting them to come in for this examination. Letters are frequently unreliable as patients often state that they are well and cured, whereas a physical examination has shown a complete recurrence of the lesion.

It was our plan to obtain a preliminary report immediately following the meeting for two reasons: (1) to get a full and correct list of all operations (the published list was frequently changed after being printed, by emergency cases being added, patients refusing operation, patients not appearing for operation, etc., etc.), and (2) to obtain a list of (a) operative deaths and (b) immediate complications. This report would cover the immediate as compared with the late or final results, and if submitted shortly after the operations were over would be more likely to contain accurate lists of any complications that might have occurred. The immediate results are comprised in the happenings up to the discharge of the patient from the hospital. The number of deaths and the number of complications reported are listed in Table III with a short description of these cases.

Examination of the above groups is of utmost interest and value when the cases are studied

individually. There are also some lessons to be drawn from the figures as groups. Thus a 4.3 per cent mortality figure for a series of major operations (and about 80 per cent can be called such) is certainly disquieting. And six of the fourteen fatalities occurred within the first thirty-six hours after operation! The complications reported vary from simple wound infection to protracted infection, serious hæmorrhage and failure of relief from symptoms. The data submitted by some hospitals, however, was so vague and generalized that no numerical relationship should be drawn.

The final group to be studied includes the reports on all cases upon whom we have obtained information after a period of at least six months following operations. This gives us additional data in regard to (1) the price of surgery and (2) its efficacy as a remedial agent. The difficulty in obtaining such late studies on cases is emphasized by the figures in Table IV where one can compare the number of cases operated upon with the number of cases about which we were able to obtain information after a six months' interval.

TABLE IV.—END-RESULTS AFTER SIX MONTHS

Hospitals	Cases operated upon.	Cases about which information was obtained six months after operation (includes fatalities).
Boston City	24	0
Massachusetts General	46	23
Peter Bent Brigham	30	27
Children's	27	23
Massachusetts Homeopathic	41	34
St. Elizabeth's	21	0
Carney	23	22
Free Hospital for Women	29	23
New England Deaconess	11	5
Boston Dispensary	1	1
New England Hospital for Women and Children	7	6
Evangeline Booth	1	1
Cambridge	13	11
Long Island	8	4
U.S. Naval	6	6
Beth Israel	10	10
Massachusetts Charitable Eye and Ear Infirmary	15	0
The Forsyth Dental Infirmary	13	0
Lying-In	1	1
	327	197

The figures in Table IV show that in 60 per cent of the cases operated upon we were able to obtain some sort of an end-result report. This in itself is not a discouraging figure and there is a certain amount of information of interest and value in the material collected. These late studies should picture the final results of the operations except in so far as they concern the cure of cancer and other malignant tumors.

The 197 cases may be briefly classified as follows:

	Cases	Per cent
Dead	17*	8.6
Unimproved	18	9.
Improved	125	63.4
Well	37	18.7
	197	

*Three cases in addition to those reported above under fatalities, died:
1. June, 1923—Cancer œsophagus with local and general extension (Massachusetts Homeopathic Hospital case).
2. March, 1923—Gall bladder at time of Congress—Death due to rupture of rectal wall, no cancer, no previous symptoms (Long Island Hospital case).
3. May, 1923—Cancer of breast at the time of Congress—Death due to cardiorenal disease (Cambridge Hospital case).

The above tabulation will have to speak for itself since it would be impossible for any individual who was not first-hand conversant with all the cases to render any reliable opinion regarding what cases were or were not correctly judged as well, as improved, unimproved, etc. Of the deaths we are certain and also of some adverse results as pictured in the few complications quoted above. Much was lacking from some of the reports while others were models of careful observations. That only 82 per cent of the cases are improved at the end of 6 months gives food for much thought.

There are obviously many things this report does not pretend to cover, such as the erroneous pre-operative diagnoses, the comparative seriousness of the operations undertaken, and what influence the fact of operations under the disadvantageous circumstances of crowded amphitheaters may have had upon the results. Even as it stands very important lessons may be drawn from it.

CLINICAL CONGRESS OF AMERICAN COLLEGE OF SURGEONS

THIRTEENTH ANNUAL SESSION, CHICAGO, OCTOBER 22–26, 1923

HARVEY CUSHING, Boston, *President* ALBERT J. OCHSNER, Chicago, *President-Elect*
FRANKLIN H. MARTIN, Chicago, *Director-General*

LOCAL EXECUTIVE COMMITTEE

ALLEN B. KANAVEL, *Chairman*

FREDERIC A. BESLEY	CHARLES DAVISON	HERMAN L. KRETSCHMER
JOHN A. CAVANAUGH	E. K. FINDLAY	PHILIP H. KREUSCHER
ARTHUR H. CURTIS	GILBERT FITZ-PATRICK	NELSON M. PERCY
CARL B. DAVIS	IRA FRANK	HERBERT A. POTTS

PLANS FOR THE CLINICAL MEETING IN CHICAGO

WEEK'S PROGRAM IN BRIEF

Monday, October 22

10–12. Hospital Conference, Gold Room, Congress Hotel. Papers and discussions.
2–5. Hospital Conference, Gold Room, Congress Hotel. Round table conference.
8. Presidential Meeting, Orchestra Hall. Inaugural address of President-Elect and Murphy Oration on Surgery.

Tuesday, October 23

9–12. Clinics and demonstrations at the hospitals and medical schools.
10–12. Hospital Conference, Florentine Room, Congress Hotel. Papers and discussions.
2–4. Clinics and demonstrations at the hospitals and medical schools.
2–5. Hospital Conference, Florentine Room, Congress Hotel. Round table conference.
3:30. Laying of corner stone of Murphy Memorial.
8. Scientific session, Gold Room, Congress Hotel. Papers and discussions.

Wednesday, October 24

9–12. Clinics and demonstrations at the hospitals and medical schools.
2–5. Clinics and demonstrations at the hospitals and medical schools.
8. Scientific session, Gold Room, Congress Hotel. Papers and discussions.

Thursday, October 25

9–12. Clinics and demonstrations at the hospitals and medical schools.
2–4. Clinics and demonstrations at the hospitals and medical schools.
4. Annual meeting of the Fellows of the American College of Surgeons, Gold Room, Congress Hotel.
8. Scientific session, Gold Room, Congress Hotel. Papers and discussions.

Friday, October 26

9–12. Clinics and demonstrations at the hospitals and medical schools.
2–5. Clinics and demonstrations at the hospitals and medical schools.
8. Eleventh Convocation of the American College of Surgeons, Auditorium Theater.

THE thirteenth annual session of the Clinical Congress of the American College of Surgery formally opens with the Hospital Conference on Monday morning at 10 o'clock in the Gold Room of the Congress Hotel, the conference being continued during the afternoon.

Beginning on Tuesday morning and continuing through the following three days, the clinics of Chicago will be open to the visiting surgeons, for whose benefit a carefully planned series of clinics and demonstrations has been prepared.

At the presidential meeting on Monday evening in Orchestra Hall, the President-Elect, Dr. Albert J. Ochsner, will be inaugurated and deliver the annual address. On this occasion, the distinguished foreign guests will be presented and Dr. George W. Crile of Cleveland will deliver the John B. Murphy oration in surgery.

A series of scientific meetings has been arranged for Tuesday, Wednesday, and Thursday evenings to be held in the Gold Room of the Congress Hotel, at which papers dealing with surgical subjects of timely interest will be read and discussed by eminent surgeons of the United States and Canada and distinguished visitors from Europe and South America.

Two special evening sessions are being arranged for those particularly interested in ophthalmology, otology, laryngology and rhinology, to be held in the Florentine Room on Tuesday and Wednesday evenings.

The eleventh convocation of the American College of Surgeons will be held in the Auditorium Theater on Friday evening, at which fellowship in the College will be conferred upon a group of American and Canadian surgeons and honorary fellowship upon the distinguished foreign visitors.

CLINICAL PROGRAM

The preliminary program of clinics and demonstrations to be given during the Chicago meeting will be found in the following pages. This program is to be further revised and amplified previous to the meeting so that the final program will completely present the clinical activities of this great medical center. All departments of surgery are to be represented therein: General surgery; gynecology; obstetrics; orthopedics; urology; surgery of the eye, ear, nose, throat, and mouth; experimental surgery; surgical pathology; roentgenology, etc.

Of very great interest will be a series of clinical demonstrations or "dry clinics" to be given in many of the hospitals in which internists, pathologists, and others will participate.

The real program of the Congress will be issued daily during the meeting. It will be posted each afternoon on the bulletin boards in the Elizabethian Room giving in complete detail the cases to be operated upon or demonstrated. A printed program will be distributed each morning containing the complete clinical program for the day and for the evening session, and other announcements.

CONGRESS HEADQUARTERS

General headquarters for the Congress will be established at the Congress Hotel where the Gold, Florentine, Elizabethian, French, and St. Francis rooms, together with the foyers and other rooms adjacent thereto on the first and second floors, have been reserved for the exclusive use of the Congress. These rooms will be utilized for evening meetings, registration and ticket bureaus, bulletin rooms, etc.

Headquarters will be open for registration at 8 a.m., Monday, October 22, and each morning thereafter at the same hour.

The clinical program for Tuesday will be bulletined during Monday afternoon and reservation for clinic tickets for Tuesday's clinics may be filed late that afternoon.

HOSPITAL CONFERENCE

The annual Hospital Conference will be held Monday and Tuesday at the Congress Hotel. The sessions on Monday will be held in the Gold Room beginning promptly at 10 a.m. and at 2 p.m., and on Tuesday in the Florentine Room at the same hours. The program for this Conference, which is published in the following pages, it will be noted, deals intimately with the details of hospital standardization and management.

The program is interesting throughout including addresses, papers, demonstrations, round-table conferences and general discussions by hospital superintendents, trustees, surgeons, nurses, and others interested in the conduct of hospitals, and will be most practical, providing so far as possible a solution for many of the everyday problems and difficulties encountered in hospital management and the care of the patient in the hospital.

At the Monday morning session, Dr. Franklin H. Martin, the Director-General, will make the annual announcement of those hospitals which appear on the approved list for 1923.

Among the new features introduced this year, possibly none will be of greater interest or more useful than the Hospital Service Bureau where detailed information will be given out and inquiries answered either verbally or by written communication.

Headquarters for the Hospital Standardization Department and the Hospital Service Bureau, together with the office of Dr. M. T. MacEachern, Associate Director in charge of hospital standardization, will be established in the French Room on the mezzanine floor adjacent to general headquarters of the Congress.

Hospital standardization headquarters will be open daily during the entire session of the Clinical Congress and those who are particularly interested in hospital problems are requested to register there upon arrival in Chicago.

REDUCED RAILWAY FARES

The railways of the United States and Canada have authorized the sale of round-trip tickets to Chicago on account of the Clinical Congress at one and one-half the ordinary one-way fare, provi-

ded that the journey be made by the same route in both directions.

Round-trip tickets at the reduced rate will be sold to members only upon presentation of identification certificates issued from the office of the Director-General. Such identification certificates will be issued to all who register in advance, one certificate being sufficient for the individual surgeon and dependent members of his family. Under this arrangement, round-trip tickets will be sold from October 18 to 24 in the central and eastern states and eastern Canada with a final return limit of November 1. In the far western states and the western provinces of Canada, the earliest selling date is October 16 with a return limit of November 3.

The reduction in fares does not apply to Pullman fares or to excess fares charged for passage on certain trains. Local railway agents will supply detailed information in regard to routes, rates, etc.

MEETING OF ORAL SURGEONS

The third annual meeting of the American Association of Oral and Plastic Surgeons will be held in the Rose Room at the Congress Hotel on Monday and Tuesday, October 22 and 23. An interesting program has been arranged and those interested in this department of surgery are cordially invited to be present. Truman W. Brophy, M.D., President; Henry Sage Dunning, M.D., Secretary and Treasurer.

LIMITED ATTENDANCE—ADVANCE REGISTRATION

Because of the popularity of these annual clinical meetings it has been found necessary in recent years to adopt the plan of limiting attendance. This plan necessitates registration in advance on the part of all who wish to attend. The limit of attendance is based upon the result of a survey of the amphitheaters, lecture rooms, and laboratories in the several hospitals and medical schools as to their capacity for accommodating visitors. When the limit of attendance has been reached through advance registration no further applications will be accepted, hence the necessity for early registration. It is to be expected that the limit of attendance will be reached some weeks in advance of the meeting.

CLINIC TICKETS

Attendance at all clinics and demonstrations is controlled by means of special clinic tickets, which are issued at headquarters each morning at 8 o'clock for that day's clinics. The use of clinic tickets has proven an efficient means of providing for the distribution of the visiting surgeons among the several clinics and insuring against overcrowding, as the number of tickets issued for any clinic is limited to the capacity of the room in which that clinic is to be given.

A complete detailed schedule of the day's clinics will be posted on bulletin boards at headquarters during the afternoon of the preceding day. After the program has been so posted, reservations for tickets for the next day's clinics may be filed, the tickets to be issued the following morning at 8 o'clock. A printed program will be issued each morning which will contain the complete clinical program for the day, with announcements of evening sessions and other information.

CHICAGO HOTELS AND THEIR RATES

While the hotels of Chicago have a large capacity for the entertainment of visitors, it is well for those expecting to attend the Congress to make reservation of hotel accommodations at the earliest possible date. The following hotels are recommended by the local committee:

	Minimum Rate Single Room	
	With Bath	Without Bath
Atlantic	$3.50	$2.00
Auditorium	5.00	2.50
Blackstone	5.00	4.00
Brevoort	3.00	2.00
Chicago Beach	4.00	3.00
Congress	4.00	3.00
Cooper-Carlton	3.50	....
Drake	5.00	....
Edgewater Beach	$3.00	$....
Fort Dearborn	2.45	1.95
Great Northern	3.50	2.50
LaSalle	4.00	2.50
Lexington	3.00	2.00
Morrison	4.00	....
Planters	3.00	2.00
Sherman	3.00	2.00

PROGRAM FOR EVENING MEETINGS

Presidential Meeting, Monday, October 22—Orchestra Hall, 8 P.M.

Address of Welcome: ALLEN B. KANAVEL, M.D., Chicago, Chairman of Committee on Arrangements.

Address of the Retiring President: HARVEY CUSHING, M.D., Boston.

Introduction of foreign guests: SIR WILLIAM I. DE COURCY WHEELER, President Royal College of Surgeons in Ireland, Dublin; A. E. WEBB-JOHNSON, C.B.E., D.S.O., F.R.C.S., London.

Inaugural Address: ALBERT J. OCHSNER, M.D., Chicago.

The Doctor John B. Murphy Oration in Surgery—GEORGE W. CRILE, M.D., Cleveland: "A Biophysical Law Governing Surgical Mortality."

Tuesday, October 23—Gold Room, Congress Hotel, 8 P.M.

SIR WILLIAM I. DE COURCY WHEELER, Dublin, Ireland:

JAMES T. CASE, M.D., Battle Creek: Significance and Value of Deep Roentgen Therapy.

SYMPOSIUM: Thoracic Surgery.

EVARTS A. GRAHAM, M.D., St. Louis: Principles Concerned in the Treatment of Acute and Chronic Empyema.

WYMAN WHITTEMORE, M.D., Boston: Etiology and Treatment of Non-Tuberculous Pulmonary Abscess.

CARL A. HEDBLOM, M.D., Rochester, Minn.: Extrapleural Thoracoplasty in the Treatment of Bronchiectasis.

Discussion: EMIL G. BECK, M.D., and D. B. PHEMISTER, M.D., Chicago.

Wednesday, October 24—Gold Room, Congress Hotel, 8 P.M.

A. E. WEBB-JOHNSON, C.B.E., D.S.O., F.R.C.S., London: Kinks of Surgical Importance.

SYMPOSIUM: Hæmorrhage.

GEORGE NEIL STEWART, M.D., D.Sc., Cleveland: General discussion.

F. N. G. STARR, M.D., Toronto: Postoperative Hæmorrhage.

ARTHUR DEAN BEVAN, M.D., Chicago: Gastric Hæmorrhage.

JOHN G. CLARK, M.D., Philadelphia: Uterine Hæmorrhage.

WILLIAM E. LOWER, M.D., Cleveland: Hæmorrhage in the Genito-Urinary Tract.

FRED H. ALBEE, M.D., New York: Rehabilitation Surgery.

Discussion: HARRY E. MOCK, M.D., and EDWIN W. RYERSON, M.D., Chicago.

Thursday, October 25—Gold Room, Congress Hotel, 8 P.M.

SYMPOSIUM: Pain.

WILLIAM D. HAGGARD, M.D., Nashville: The Surgical Significance of Pain.

JAMES M. PATTON, M.D., Omaha: Pain as the Result of Surgical Lesions in the Eye.

JOHN F. BARNHILL, M.D., Indianapolis: Pain Due to Lesions of the Intracranial Structure.

FRANK M. SULZMAN, M.D., Troy, N. Y.: Pain in the Ear.

R. D. KENNEDY, M.D., Globe, Arizona: Pain in the Joints and Back.

RICHARD R. SMITH, M.D., Grand Rapids: Pain in the Distal Regions of the Body Due to Gynecological Affections.

A. J. CROWELL, M.D., Charlotte, N. C.: Pain of the Genito-Urinary Organs.

T. CASEY WITHERSPOON, M.D., Butte: Pains in the Chest and Upper Abdominal Regions.

WILLIAM J. MAYO, M.D., Rochester, Minn.: The Co-ordination of Human Vegetative Functions.

Convocation, Friday, October 26—Auditorium Theater, 8 P.M.

Invocation: REV. JOHN TIMOTHY STONE, D.D.

Conferring of Honorary Fellowships.

Presentation of Candidates for Fellowship.

Presidential Address: ALBERT J. OCHSNER, M.D., Chicago.

Fellowship Address.

HOSPITAL CONFERENCE

MONDAY, OCTOBER 22, GOLD ROOM, CONGRESS HOTEL

HARVEY CUSHING, M.D., Boston, President, Presiding

Morning Session, 10 to 12:30

Opening Address by the President.

The American College of Surgeons and Better Hospitals for the Sick. FRANKLIN H. MARTIN, M.D., Chicago, Director-General of American College of Surgeons.

The 1923 Survey—Problems and Conclusions from a Study Thereof and Plans for 1924. MALCOLM T. MACEACHERN, M.D., Chicago, Associate Director of American College of Surgeons, in charge of Hospital Standardization.

Hospital Standardization and the Medical, Nursing, and Hospital Professions. REV. C. B. MOULINIER, S. J., Milwaukee, President of Catholic Hospital Association.

Hospital Standardization and the Community Hospital. JOHN B. MCKENZIE, M.D., Logieville, New Brunswick, Surgeon to Miramichi Memorial Hospital, Newcastle, and Hôtel Dieu Hospital, Chatham, New Brunswick.

Sidelights on Hospital Standardization from the Hospital Surveyor. E. W. WILLIAMSON, M.D., Chicago, Hospital Visitor, 1923.

Approved Hospitals a Factor in Advancing Scientific Medicine. D. ALLAN CRAIG, M.D., Chicago, Associate Director of American College of Surgeons, in charge of State and Provincial Activities.

A Review of the Present Status of Nursing in the United States and Canada with Possible Future Developments. ISABELLE M. STEWART, R.N., New York, Assistant Professor of Nursing, Columbia University; and JEANE BROWN, R.N., President of Canadian National Association of Trained Nurses, Toronto.

A Comparison—The Care of the Patient in the Standard versus the Non-Standard Hospital. ROBERT JOLLY, Superintendent of Baptist Hospital, Houston, Texas.

Afternoon Session, 2 to 4:30

The Value and Need of More Attention to End-Results and Follow-Up in Hospitals To-Day. GEORGE GRAY WARD, JR., M.D., New York, Professor of Obstetrics and Gynecology, Cornell University Medical College; Chief Surgeon, Woman's Hospital.

The Registry of Bone Sarcoma as an Example of the End-Result Idea in Hospital Organization. ERNEST A. CODMAN, M.D., Boston, Massachusetts.

A Scheme for Surgical Rating. ERNEST LEROI HUNT, M.D., Worcester, Massachusetts, Surgeon and Director of Surgical Service, Worcester City Hospital.

The Problem of the Hospital Interne. A. R. WARNER, M.D., Chicago, Executive Secretary, American Hospital Association.

Round Table Conference—Conducted by FRANK D. JENNINGS, M.D., Brooklyn, New York. Topics for discussion: Individual signing of fee-splitting pledge. Single interpretation of anti-fee-splitting pledge. Effect of fee-splitting on continuance of hospital on approved list. Remedy for failure to keep hospital records. Routine pathological analyses and basis on which charges should be made. Ratio of internes and nurses to patients. Location of X-ray and clinical laboratory in relation to service. Necessity of having record clerk, clinical and X-ray laboratory technicians; might not one person suffice in hospital under 100 beds. Overcoming difficulties of interne service. Advantages of hospital standardization movement.

TUESDAY, OCTOBER 23, FLORENTINE ROOM, CONGRESS HOTEL

A. J. OCHSNER, M.D., President, Presiding

Morning Session, 10 to 12

Symposium—Hospital Standardization.

Staff Organization: (1) Fundamental principles in selecting and organizing a hospital staff. (2) The staff conference agenda and procedure. (3) Difficulties encountered and how to overcome them. (4) Discussion.

Case Records: (1) Organization of a case record department. (2) The component parts of a good record. (3) The securing, supervising, and filing of records. (4) Essentials in nurses' records. (5) Difficulties encountered and how to overcome them. (6) Discussion.

Afternoon Session, 2 to 4:30

Symposium—Hospital Standardization (*continued*).

The Clinical Laboratory: (1) Organization and scope of service. (2) The laboratory technician. (3) Laboratory records. (4) Methods of laboratory charges. (5) Discussion.

The X-Ray Department: (1) Organization and scope of work. (2) The X-ray technician. (3) Interpretation of findings. (4) X-ray records. (5) Discussion.

Round Table Conference—Conducted by E. S. GILMORE, Superintendent, Wesley Hospital, Chicago. Topics for discussion: Responsibility and liability of hospitals. Doctor's orders. Access to patients' records. Anæsthesia in hospitals. Pre-operative cases. Record of infections. Appraising of hospital records. System of nomenclature. Booking operations. Computing hospital death rates. What are the advantages of a physiotherapy department?

PRELIMINARY CLINICAL PROGRAM

COOK COUNTY HOSPITAL

Operative clinics, daily, morning and afternoon. Pathological conference, daily, 11. Clinical demonstrations will be given as follows:

F. A. BESLEY—Sarcoma of the extremities, with exhibit of cases.

W. R. CUBBINS—Indications for enterostomy in intestinal obstruction.

VERNON DAVID—Osteomyelitis in children; also local recurrence in carcinoma of the rectum.

GEORGE DAVENPORT—Demonstration: Ventriculography in brain lesions.

G. G. DAVIS—Injuries of the spine and spinal cord.

F. G. DYAS—Carcinoma of the stomach.

D. N. EISENDRATH—Cases illustrating surgery of the kidney and ureter.

HARRY JACKSON—Rôle of intracranial pressure in injuries of the brain and skull.

E. J. LEWIS—Early management of compound fractures.

HUGH MCKENNA—Cases of fracture of the neck of the femur.

R. W. MCNEALY—Aneurism of the aorta and peripheral vessels.

KARL MEYER—Acute perforating ulcers of the stomach.

PAUL OLIVER—Carcinoma of the breast.

K. SPEED—Standardization of fracture treatment; arthroplasty.

D. C. STRAUS—Diagnosis and treatment of cholecystitis and cholelithiasis.

GEORGE THOMPSON—Common-duct stones.

R. T. VAUGHAN—Lung abscess.

BERTHA VAN HOOSEN—Gynecological and obstetrical cases.

ST. LUKE'S HOSPITAL

Tuesday, October 23

JOSEPH A. CAPPS, JOSEPH L. MILLER, A. R. ELLIOTT, ROBERT B. PREBLE, and M. C. GILBERT—9. Diagnostic clinics.

GEORGE W. HALL—9. Neurosurgical cases.

EDWARD L. JENKINS—9. Roentgenological demonstration.

EDWIN F. HIRSCH—9. Pathological demonstration.

NORVAL H. PIERCE, G. PAULL MARQUIS, EDWARD P. NORCROSS, J. T. CAMPBELL, WALTER H. THEOBALD, and JOHN A. CAVANAUGH—2. Skiagraphs of the mastoid in relation to disease. Indications for operation in acute mastoid inflammation with demonstration of operative technique.

Wednesday, October 24

L. L. MCARTHUR—9. General surgery.

T. J. WATKINS, A. H. CURTIS, and H. O. JONES—2. Gynecological clinic.

Thursday, October 25

THOMAS L. GILMER—9. Oral surgery.

WILLIAM HARSHA and S. C. PLUMMER—10. General surgery.

J. L. PORTER, E. W. RYERSON, H. B. THOMAS, and P. LEWIN—2. Orthopedic clinic.

Friday, October 26

A. E. HALSTEAD—9. General surgery.

J. L. PORTER, E. W. RYERSON, H. B. THOMAS, and P. LEWIN—2. Orthopedic clinic.

MICHAEL REESE HOSPITAL

Tuesday, October 23

D. N. EISENDRATH—9. Kidney and bladder operations.
A. A. STRAUSS—9. Gastric and duodenal ulcer cases, operations. Pyloric stenosis.
EDMUND ANDREWS—9. Hernia operations and demonstration of cases.
CHARLES JACOBS, M. A. BERNSTEIN, and JAMES PATEJDL—9. Orthopedic clinic, operations and demonstration of cases.
HARRY KAHN—9. Ultraviolet rays in diseases of the nose and throat.

Wednesday, October 24

E. WYLLYS ANDREWS—9. General surgical operations.
LOUIS A. GREENSFELDER—9. Thyroid operations.
DAVID C. STRAUSS—9. Fracture and osteomyelitis clinic, operations and demonstration of cases.
RALPH BETTMAN—9. Surgery of the chest.
LESTER E. FRANKENTHAL—9. Gynecological and obstetrical operations.
IRVING STEIN—9. Gynecological and obstetrical operations: pneumoperitoneum.
LUDWIG SIMON—9. Obstetrical operations.
JEROME STRAUSS—2. Nose and throat clinic.

Thursday, October 25

EMANUEL FRIEND—9. Gall-bladder operations.
D. N. EISENDRATH—9. Kidney and bladder operations.
GEORGE L. DAVENPORT—9. Ventriculography. Brain tumor cases.
HARRY JACKSON—9. Management of acute cranial injuries.
JOSEPH L. BAER—9. Gynecological and obstetrical operations; capillaroscopy.
JULIUS E. LACKNER—9. Gynecological and obstetrical operations.
WILLIAM RUBOVITZ—9. Gynecological and obstetrical operations.
HARRY KAHN—9. Ultraviolet rays in disease of the nose and throat.
ROBERT SONNENSCHEIN—9. Nose and throat clinic.
IRA FRANK—2. Nose and throat clinic.

Friday, October 26

L. A. GREENSFELDER—9. Thyroid operations.
D. C. STRAUSS—9. Gall-bladder cases.
A. A. STRAUSS—9. Gastric and duodenal ulcer cases.
L. E. SCHMIDT, G. KOLISCHER, I. S. KOLL, J. S. EISENSTAEDT, and H. KATZ—9. Genito-urinary clinic, operations and demonstration of cases.
ROBERT SONNENSCHEIN—9. Nose and throat clinic.

NELSON MORRIS INSTITUTE FOR RESEARCH

Tuesday, October 23

LOUIS A. GREENSFELDER—2. Thyroid clinic, demonstration of cases.
DAVID C. STRAUSS—2. Recent advances in the treatment of fractures and osteomyelitis, with special reference to children.
RALPH BETTMAN—2. Thoracic surgery, with demonstration of cases.

Wednesday, October 24

D. N. EISENDRATH—2. Kidney and bladder cases.
A. A. STRAUSS—2. Demonstration of cases: Stomach resections for gastric and duodenal ulcer by the Pólya and Billroth I and II methods; longitudinal resection of lesser curvature with pyloric sphincter resection.
D. C. STRAUSS—2. Recent advances in gall-bladder surgery.

Thursday, October 25

EMANUEL FRIEND, EDMUND ANDREWS, GEORGE L. DAVENPORT, and HARRY JACKSON—2. Demonstration of cases: Billroth II operation for carcinoma of stomach Sarcoma of skull. Pyrogoff amputation, 2 cases, for endarteritis obliterans. Gall-bladder operations.
EDMUND ANDREWS—2. Hernia clinic, demonstration of cases.

Daily

O. T. SCHULTZ—2. Pathological demonstrations.
B. PORTIS—2. Protective mechanisms of the omentum.
W. BLOOM—2. Experimental studies in obstructive jaundice.
W. H. ROSENAU—2. Clinical and experimental studies on liver function.
ROBERT A. ARENS—2. Demonstrations in X-ray department: Recent advances in the new high voltage treatment of surgical cases with special reference to precise methods of measuring X-ray quantity. Cases of sarcoma treated by the higher voltage. Exhibit of plates showing surgical lesions.

ST. JOSEPH'S HOSPITAL

Tuesday, October 23

HUGH MCKENNA—9. Inguinal hernia, appendectomy, gall bladder, bone transplant for non-union, demonstration of author's fracture table.
A. A. HAYDEN—9. Stacke operation for chronic purulent mastoiditis; suture of pillars for control of hæmorrhage in tonsillectomy; demonstration of head bandages; correction of external nasal deformities; carcinoma of tonsil, demonstration of patient, pictures and microscopic sections.
CHARLES MCKENNA—10. Vasotomy, prostatectomy, nephrectomy, inguinal hernia.
TRUMAN BROPHY—10. Cleft palate and hair-lip cases.

Wednesday, October 24

THOMAS O'DONOHUE—9. Demonstration: Cases of resection of sigmoid for malignancy with X-ray pictures before and after operation; cases of multiple diverticulitis of large bowel.
FRANK DAVID—9. Hæmorrhoids, fistula of rectum.
OSCAR OFNER—10. Conservative or radical treatment of inflammatory adnexa of the uterus.
W. H. G. LOGAN—10. Cleft palate and hair-lip cases.
W. GROSVENOR, FRED ROHR, and L. W. MARTIN—Demonstration of obstetrical technique with manikin.

Thursday, October 25

J. Z. BERGERON—9. Canfield antrum operation, frontal sinus operation, tonsillectomies.
J. HOLINGER—10. Bexold mastoid operation.
FRANK B. MCCARTHY—10. Abdominal operations.

SPECIAL DEMONSTRATIONS

L. E. HINES—Pathological findings in a fatal case of heart disease associated with pregnancy.
WILLIAM H. BURMEISTER, LELAND SHAFER, and F. O. FREDERICKSON—Medico-surgical cases with fluoroscopy of the chest and following bismuth meals.
E. L. JENKINSON—Daily, 3. Demonstrations in the use of deep X-ray therapy.

AUGUSTANA HOSPITAL

Tuesday, October 23

N. M. PERCY—9. General surgery.
DENNIS W. CRILE—2. Fracture clinic.

Wednesday, October 24

A. J. OCHSNER—9. General surgery.
E. H. OCHSNER—9. General surgery.
RUDOLPH ODEN—2. General surgery.
RUDOLPH HOLMES—3:30. Obstetrical clinic.

Thursday, October 25

N. M. PERCY—9. General surgery.
JOHN NUZUM—2. General surgery.

Friday, October 26

A. J. OCHSNER—9. General surgery.
E. H. OCHSNER—9. General surgery.
ALFRED MURRAY—2. Sinus clinic.

MERCY HOSPITAL

Tuesday, October 23

J. F. GOLDEN, C. F. SAWYER, and E. L. MOORHEAD—9. General surgery.
G. W. MAHONEY—9. Eye clinic.
L. D. MOORHEAD—2. General surgery.
H. DOOLEY—2. Genito-urinary clinic.

Wednesday, October 24

PHILIP H. KREUSCHER—9. Bone and joint clinic, operations and demonstration of cases.
E. L. MOORHEAD and F. E. PIERCE—9. General surgical operations.
HENRY SCHMITZ—9. Gynecological clinic.
R. J. TIVNEN—9. Eye, ear, nose, and throat clinic.
JOHN D. CLARIDGE—2. Bone and joint clinic.
C. LARKIN—2. General surgery.

Thursday, October 25

E. L. MOORHEAD and C. F. SAWYER—9. General surgery.
PHILIP H. KREUSCHER—9. Bone and joint clinic.
R. J. TIVNEN—9. Eye, ear, nose, and throat clinic.
H. DOOLEY—2. Genito-urinary clinic.
J. F. GOLDEN—2. General surgery.

Friday, October 26

PHILIP H. KREUSCHER—9. Special arthroplasty clinic.
HENRY SCHMITZ—9. Gynecological clinic.
JOHN F. GOLDEN—9. General surgery.

Daily

STAFF—9–5. Out-patient clinics. X-ray demonstrations.

ILLINOIS MASONIC HOSPITAL

Tuesday, October 23

JOHN R. HARGER—9. Surgical clinic.

Wednesday, October 24

N. H. LOWRY—9. Demonstration of perivertebral anæsthesia in abdominal surgery; cholecystectomy, partial gastrectomy, appendectomy.
E. W. WHITE—10:30. Urological clinic.
ALVA SOWERS—2. Eye clinic.

Thursday, October 25

LEROY THOMPSON—9. Nose and throat clinic.

WESLEY MEMORIAL HOSPITAL

Tuesday, October 23

MARK T. GOLDSTINE—9. Vaginal plastics.
STAFF—2. Dry clinic: J. GORDON WILSON—Differentiation between labyrinthine and cerebellar disease. OTIS H. MACLAY—Ethmoid infections. C. B. YOUNGER—Sinus infections. C. F. BOOKWALTER—The intranasal operation on the tear sac.

Wednesday, October 24

ALLEN B. KANAVEL—9. Brain tumor. Plastics on the hands and face. Goiter.
JOHN A. WOLFER—2. Gastric surgery.

Thursday, October 25

WILLIAM E. SCHROEDER—9. Breast tumors. Kidney surgery.
PAUL B. MAGNUSON—2 Bone grafts in the spine. Operations on old fractures of the os calcis. Injuries about the shoulder, elbow, and wrist joint.

Friday, October 26

H. M. RICHTER—9. Gall-bladder diseases. Goiter and stomach cases.
V. D. LESPINASSE—2. Sterility cases.
CHARLES B. REED—3:30. Measurements of the fetus in utero. Induction of labor and bag work.

LUTHERAN DEACONESS HOSPITAL

Tuesday, October 23

E. E. HENDERSON and G. H. SCHROEDER—9. General surgery, diagnostic and operative clinic.

Wednesday, October 24

S. DAHL—9. General surgery.
I. PILOT—9. The habitat and distribution of hæmolytic streptococci and their rôle in surgical infections.

Thursday, October 25

A. E. KANTER—9. Gynecological clinic.

Friday, October 26

E. E. HENDERSON and G. H. SCHROEDER—9. General surgery, diagnostic and operative clinic.
R. HOUSEHOLDER—9. X-ray diagnosis of surgical conditions.

UNIVERSITY HOSPITAL

Tuesday, October 23

E. V. L. BROWN—9. Eye clinic.
C. C. ROGERS—10. General surgery.

Wednesday, October 24

HARRY CULVER—9. Urological clinic.
CHARLES DAVISON—10. General surgery, cases of undescended testicle.
CHARLES DAVISON—2. General surgery.

Thursday, October 25

J. P. SPRAGUE—9. Orthopedic surgery.
KARL A. MEYER—10. General surgery, gastro-intestinal cases.

Friday, October 26

WILLIAM E. GAMBLE—9. Eye clinic.
C. S. BACON—10. Obstetrical clinic.

U. S. VETERAN'S HOSPITAL No. 76

Tuesday, October 23

PAUL BROWN—9:30. General surgical operations.

Wednesday, October 24

H. L. KRETSCHMER—9:30. Genito-urinary clinic, operations and demonstrations of cases.

D. B. PHEMISTER—2. Cranioplasty, operation. Clinical demonstrations: Compression of spinal cord by tumor in von Recklinghausen's neurofibromatosis. Plastic operations on the face. Treatment of chronic empyema.

Thursday, October 25

PAUL BROWN—9:30. Operations and demonstration of cases.

EDWIN W. RYERSON—2. Orthopedic clinic: Resection of hip for tuberculous arthritis, operation. Demonstration of cases.

ST. MARY'S HOSPITAL

Tuesday, October 23

D. A. ORTH and GEORGE MUELLER—9. General surgery.
H. SCHMITZ, H. BUNDY, and J. LAIBE—9. Radium clinic.
F. B. LUSK—2. Laboratory demonstrations.
C. CHALLENGER—2. X-ray demonstrations.

Wednesday, October 24

N. M. PERCY, O. E. NADEAU, W. A. KEWFLEWSKI, and T. Z. XELOWSKI—9. General surgery.
J. J. KILLEEN—2. Ear, nose, and throat clinic.
G. W. MAHONEY—2. Eye clinic.

Thursday, October 25

A. J. OCHSNER, D. A. ORTH, GEORGE MUELLER, and O. E. NADEAU—9. General surgery.
D. W. CRILE—2. Orthopedic clinic.

Friday, October 26

R. E. FLANNERY, E. PATERA, M. J. SEIFERT, and C. STOTZ—9. General surgery.
J. WELFELD—2. Genito-urinary and skin clinic.

CHICAGO MEMORIAL HOSPITAL

Tuesday, October 23

DAVID S. HILLIS and J. E. FITZGERALD—9. Obstetrical clinic.
JULIA C. STRAWN and A. E. KANTER—10. Gynecological clinic.
STAFF—2. Eye, ear, nose, and throat clinic.

Wednesday, October 24

H. R. CHISLETT, CHARLES E. KAHLKE, PETER S. CLARK, R. A. MELENDY, P. M. OLIVER, and W. M. HANCHETT—9. General surgical clinic.
D. N. EISENDRATH, J. M. MALTMAN, and D. G. BRUNJES—11. Genito-urinary clinic.

Thursday, October 25

DENNIS W. CRILE—9. Orthopedic clinic.
JULIA C. STRAWN, A. E. KANTER, DAVID S. HILLIS, and J. E. FITZGERALD—11. Gynecological and obstetrical clinic.
STAFF—2. Eye, ear, nose, and throat clinic.

Friday, October 26

STAFF—9. Presentation of borderline cases from all departments.

CHILDREN'S MEMORIAL HOSPITAL

Tuesday, October 23

ALBERT H. MONTGOMERY—2. General surgery.
THOMAS GALLOWAY—2. Nose and throat clinic.

Wednesday, October 24

M. HANCHETT—9. General surgical operations
WALTER C. BURKET—2. General surgery.
EDWIN W. RYERSON and ROBERT O. RITTER—3. Orthopedic operations.

Thursday, October 25

THOMAS GALLOWAY—10:30. Nose and throat operations.
EDWIN MILLER and ERNEST MCGILL—2. General surgery.
JOHN C. WILLIAMS—2. Nose and throat clinic.

Friday, October 26

ALBERT H. MONTGOMERY—9. General surgical operations
M. HANCHETT—2. General surgery.
EDSON FOWLER—3. Orthopedic clinic.

WASHINGTON BOULEVARD HOSPITAL

Wednesday, October 24

B. F. LOUNSBURY and A. R. METZ—9. General surgery.
B. F. LOUNSBURY, A. R. METZ, B. C. CORBUS, and V. J. O'CONOR—2. Diathermy in the treatment of cancer of the bladder; electro-coagulation of carcinomata. Operations and demonstrations of cases, methods, and cystoscopic examinations of apparently cured cases.

Thursday, October 25

B. F. LOUNSBURY and A. R. METZ—9. General surgery.
B. F. LOUNSBURY, A. R. METZ, B. C. CORBUS, and V. J. O'CONOR—2. Diathermy in the treatment of cancer of the bladder; electro-coagulation of carcinomata. Operations and demonstration of cases, methods, and cystoscopic examinations of apprently cured cases.

ST. ANTHONY'S HOSPITAL

Tuesday, October 23

LAWRENCE RYAN—9. Plastic surgery, operative clinic.
F. J. E. EHRMANN, JOSEPH ZABOKRTSKY, and S. E. DONLON—2. General surgical clinic.

Wednesday, October 24

F. J. E. EHRMANN, JOSEPH ZABOKRTSKY, S. E. DONLON, and J. J. SPRAFKA—9. General surgical operations.
LAWRENCE RYAN—2. Dry clinic, plastic surgery.
EVELYN EHRMANN and F. B. OLENTINE—2. Laboratory demonstrations.

Thursday, October 25

LAWRENCE RYAN, R. C. CUPLER, JOSEPH ZABOKRTSKY, and F. B. OLENTINE—9. General surgical operations.
OTTO JIRSA—2. Demonstration of genito-urinary cases.
L. S. TICHY—2. X-ray demonstration.

Friday, October 26

J. E. STANTON, F. J. FARA, ROBERT HARDIE, and J. C. STUBBS—9. Staff meeting with presentation of cases.
JOHN THEOBALD and H. M. THOMETZ—2. Nose and throat clinic.
MAX WEISSKOPF—2. Obstetrical clinic.

GRANT HOSPITAL

Tuesday, October 23

JACOB FRANK, A. G. ZIMMERMAN, and WILLIAM HESSERT—General surgery.
ERNST SAURENHAUS, E. W. FISCHMANN and C. S. BACON—Gynecology and obstetrics.
J. HOLINGER and G. T. VON COLDITZ—Eye, ear, nose, and throat.
L. E. SCHMIDT—Urology.
G. EDWIN BAXTER—Pediatrics.

Wednesday, October 24

SYLVAN COOMBS and H. EDWARD SAUER—General surgery.
W. A. STUHR and JULIUS E. LACKNER—Gynecology and obstetrics.
GEORGE J. DENNIS and O. H. KRAFT—Eye, ear, nose, and throat.
P. G. KITTERMAN—X-ray.

Thursday, October 25

F. H. PIRNAT and WILLIAM HESSERT—General surgery.
THEODORE WILD—Eye, ear, nose, and throat.
ERNST LACKNER and FRANKLIN J. CORPER—Pediatrics.

Friday, October 26

A. G. ZIMMERMAN, LEON FEINGOLD, JOHN SIEBEL, and ARTHUR FRY—General surgery.
C. S. BACON—Gynecology and obstetrics.
LUDWIG ABELE and G. T. VON COLDITZ—Eye, ear, nose, and throat.

WOMEN'S AND CHILDREN'S HOSPITAL

Tuesday, October 23

ANNA BLOUNT—9. General surgery.
MARGUERITE JONES and NORA RAGER—9. Nose and throat clinic.
BERTHA SHAFER—2. Syphilis clinic.
EFFA V. DAVIS, RHODA P. BARSTOW, and JOHANNA HEUMANN—3. Pediatric clinic.

Wednesday, October 24

LENA K. SADLER and JULIA STRAWN—9. General surgery.
LILLIAN E. TAYLOR and GERTRUDE THOMPSON—9. Nose and throat clinic.
SARAH M. HOBSON, CLARA FERGUSON, ARMINA HILL, MARIE ORTMAYER, and ELIZA MORSE—2. Medico-surgical clinic.

Thursday, October 25

ALICE CONKLIN—9. General surgery.
KATHERINE B. RICH and ROSE Z. BENNET—9. Nose and throat clinic.
STAFF—2. Cancer clinic: MAUD SLYE—Heredity of cancer. HELEN B. FLYNN—Infection of cancer and serum treatment. MARY E. HANKS—X-ray treatment of cancer. WALBURGA KACIN—Emetin treatment in cancer. Radium treatment.

Friday, October 26

BERTHA E. BUSH and MARY J. KEARSLEY—9. General surgery.
JANE F. BEEM and H. STEPHENS-WALKER—9. Nose and throat surgery.
RACHEL S. YARROW, PEARL M. STETLER, VESPER R. SHAFFER, LOUISE ACRES, HELGA RUUD—2. Obstetrical clinic. Demonstration of twilight sleep.

COLUMBUS HOSPITAL

Tuesday, October 23

J. R. PENNINGTON—9. Rectal diseases.
M. M. RITTER—11. Eye, ear, nose, and throat clinic.
W. H. O. HOFFMAN—2. Pediatric clinic.
S. R. PIETROWICZ—3. Medico-surgical cases.
J. DAMIANI—4. Roentgenological diagnosis.

Wednesday, October 24

DANIEL A. ORTH, W. B. GERHARD, T. A. CARTER, WILLIAM SADLER, M. J. SEIFERT, and L. C. QUINN—9. General surgical clinic.
J. E. H. ATKEISSON—2. Anæsthesia.
W. H. GEHL—3. Genito-urinary surgery.
C. W. BARRETT—4. Gynecological clinic.

Thursday, October 25

FREDERICK MUELLER—9. Orthopedic clinic.
LENA SADLER—11. Gynecological and obstetrical clinic.
O. W. MCMICHAEL—2. Medico-surgical cases.
HAROLD MOYER—3. Neuro-surgical cases.
C. O. GETTY—4. Laboratory demonstrations.

Friday, October 26

DANIEL A. ORTH, W. B. GERHARD, T. A. CARTER, WILLIAM SADLER, M. J. SEIFERT, and L. C. QUINN—9. General surgical clinic.
C. O. LINDSTROM—2. Eye, ear, nose, and throat clinic.
JOSEPH WELFELD—3. Dermatology.
L. P. KUHN—4. Industrial surgery.

Daily at 8:30

Emergency drill by surgical nurses.

LOYOLA UNIVERSITY MEDICAL SCHOOL

Tuesday, October 23

LLOYD ARNOLD—2. Demonstration in pathology and bacteriology of surgical interest.

Wednesday, October 24

M. T. STRONG and T. T. JOBE—2. Demonstration in anatomy.

Thursday, October 25

S. A. MATTHEWS—2. Demonstration in physiology.

Friday, October 26

W. C. AUSTIN—2. Demonstration in chemistry.

EYE AND EAR INFIRMARY

Tuesday, October 23

M. GOLDENBURG and R. VON DER HEYDT—2. Eye clinic.
H. R. BOETTCHER—2. Ear, nose, and throat clinic.

Wednesday, October 24

D. C. ORCUTT—2. Eye clinic.
N. H. PIERCE—2. Ear, nose, and throat clinic.

Thursday, October 25

E. K. FINDLAY—2. Eye clinic.
U. J. GRIM—2. Ear, nose, and throat clinic.

Friday, October 26

H. W. WOODRUFF—2. Eye clinic.
S. M. HAGER—2. Ear, nose, and throat clinic.

PRESBYTERIAN HOSPITAL

A. D. Bevan, Dean Lewis, Carl B. Davis, D. B. Phemister, Gatewood, V. C. David, H. L. Kretschmer, R. H. Herbst, G. L. McWhorter, Edward Miller, A. H. Montgomery, F. B. Moorehead, C. A. Parker—General surgery, urology, orthopedics.
N. S. Heaney, Carey Culbertson, W. F. Hewitt—Gynecological clinics.
W. H. Wilder and assistants—Eye clinics.
G. E. Shambaugh and assistants—Nose and throat clinics.

NORTH CHICAGO HOSPITAL

Carl Beck and J. Frederick Harvey—Surgery of duodenal ulcer. Functional plastic operations on the extremities.
Emil G. Beck—Treatment of cancer by open method.
Benjamin H. Orndoff and staff—Diagnostic clinic: Pneumoperitoneum and X-ray.
Joseph C. Beck, Harry L. Pollock and Francis L. Lederer—Eye, ear, nose and throat operations, and demonstration of cases.

RAVENSWOOD HOSPITAL

Tuesday, October 23

Darwin Pond—9. General surgery. Fracture cases.

Wednesday, October 24

Clark A. Buswell—9. General surgery. Laparotomies, tonsillectomies.

Thursday, October 25

G. W. Green and G. N. Bussey—9. General surgery. Goiter cases and laparotomies.

MT. SINAI HOSPITAL

H. M. Richter—Surgery of the thyroid and the bile tracts.
V. L. Schrager—Abdominal surgery, hernia cases.

THE BREMERMAN HOSPITAL

L. W. Bremerman, William Yonker, and Dr. Holmes—daily, 9 and 12. Urological clinics.

SOUTH SHORE HOSPITAL

Tuesday, October 23

Axel Werelius and Weller van Hook—9. General surgery.

Wednesday, October 24

Axel Werelius and Weller van Hook—9. General surgery.

HOME FOR DESTITUTE CRIPPLED CHILDREN

Tuesday, October 23

Elvin J. Berkheiser—2. Orthopedic clinic.

Wednesday, October 24

Charles A. Parker—2. Orthopedic clinic.

Thursday, October 25

Jacob Meyer—2. Orthopedic clinic.

Friday, October 26

Elvin J. Berkheiser—2. Orthopedic clinic.

HENROTIN HOSPITAL

Tuesday and Thursday, October 23 and 24

Burton Haseltine, Gilbert Fitz-Patrick, A. H. Waterman, A. W. LaForge, Clifford Mitchell, and Theodore Proxmire—2:30. Symposium on bronchial asthma with exhibition of cured cases. Discussions by Drs. Paul Hohly, Toledo, Ohio, H. M. Goddard, Philadelphia, and I. O. Denman, Toledo, Ohio.

ST. ANNE'S HOSPITAL

Tuesday, October 23

B. W. Mack, George W. Post, Jr., Thomas E. Meany, and J. J. McGrory—9. General surgical operations.

Wednesday, October 24

George W. Post, Jr., B. W. Mack, and J. J. McGrory—9. Dry clinic.

Thursday, October 25

B. W. Mack, H. J. Dooley, and George W. Post, Jr.—9. General surgical operations.

FRANCES WILLARD HOSPITAL

Tuesday, October 23

French Cary—2. Genito-urinary clinic.

Wednesday, October 24

Frank D. Moore—2. General surgery.

Thursday, October 25

Bertha van Hoosen—9. Gynecology and obstetrics.
Victor L. Schrager—2. General surgery.

LYING-IN HOSPITAL

J. B. DeLee, D. S. Hillis, D. F. Monash, E. L. Cornell, D. A. Horner, and Anna R. Lapham—Daily, 2. Obstetrical clinic.